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Protocol Data Units For Distributed Interactive Simulation: Military Standard (draft)

University of Central Florida Institute for Simulation and Training

INSTITUTE FOR SIMULATION AND TRAINING

PROTOCOL DATA UNITS FOR DISTRIBUTED INTERACTIVE SIMULATION

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MILITARY STANDARD (DRAFT)

Protocol Data Units for Distributed Interactive Simulation

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Division of Sponsored Research

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METRIC

DRAFT STANDARD
15 JUNE 1990

MILITARY STANDARD

ENTITY INTERACTION PROTOCOL DATA UNITS FOR

DISTRIBUTED INTERACTIVE SIMULATION

"NOTE: This draft, dated 15 June 1990, prepared by the Institute for Simulation and Training for PM TRADE, has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL. (Project _____)"

FOREWORD

1. This draft military standard has been prepared by the Institute for Simulation and Training for PM TRADE and DARPA based upon currently available technical information but it has not been approved for promulgation. It is subject to modification. However, pending its promulgation as a coordinated military standard, it may be used.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Dr. Bruce McDonald, Institute for Simulation and Training, 12424 Research Parkway, Suite 300, Orlando, FL 32826 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

3. This standard contains requirements for a communication protocol between simulated entities in a Distributed Interactive Simulation (DIS). This protocol focuses on communication related to the interactions that take place between entities. Because of this fact, protocol related to other aspects of DIS are not specified as requirements. The system designer must recognize this fact and design software that will be flexible enough to incorporate new protocols as they become available. This flexibility must also allow for updates in the protocol that may result from technological advances and increased fidelity requirements.

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1. SCOPE

1.1 Scope. This standard establishes the requirements for data units exchanged between simulated elements in a distributed interactive simulation. It encompasses a portion of the application layer of a communications architecture as defined by the International Organization for Standardization's (ISO) Open Systems Interconnection (OSI) Reference Model (see Appendix A).

1.2 Application. When invoked in a specification or statement of work, these requirements shall apply to simulation devices intended for participation in a Distributed Interactive Simulation (DIS). The contractor is responsible for invoking all the applicable requirements of this Military Standard on any and all subcontractors he may employ.

2. Applicable Documents

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks.

MILITARY

MIL-STD-1777 - Internet Protocol Specification, Appendix A.

2.2 Non-Government publications.

STANDARDS

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7498 - OSI Reference Model
ISO 8824 - Abstract Syntax Notation One
ISO 8825 - Basic Encoding Rules

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS(IEEE)

IEEE 754-1985 - Standard for floating point numbers

NON-STANDARD PUBLICATIONS

SIMNET

BBN RPT. 7102 - The SIMNET Network and Protocols

INTEROPERABILITY MEETINGS

IST-CF-89-1 - Summary Report: The First Conference on Standards for the Interoperability of Defense Simulations

IST-CF-90-01 - Summary Report: The Second Conference on Standards for the Interoperability of Defense Simulations

POSITION PAPERS (see IST-CF-90 Volume III)

ACCOMPANYING DOCUMENTS

IST-PD-90-1 - Rationale Document for Entity Interaction Protocol for Distributed Interactive Simulation

3. DEFINITIONS

3.1 Acronyms used in this standard. The acronyms used in this standard are defined as follows:

a. ASCII - American Standard Code for Information Interchange.

b. BAM - Binary Angle Measurement.

c. BIT - Binary digit.

d. CCITT - Consultative Committee for International Telephony and Telegraphy.

e. CWI - Continuous Wave Illuminations.

f. DARPA - Defense Advanced Research Projects Agency.

g. DIS - Distributed Interactive Simulation.

h. DRN - Data Representation Notation.

i. EHF - Extremely High Frequency.

j. HF - High Frequency.

k. ISO - International Organization for Standardization.

l. LAN - Local Area Network.

m. LF - Low Frequency.

n. OSI - Open Systems Interconnection.

o. PDU - Protocol Data Unit.

p. PRF - Pulse Repetition Frequency.

q. SHF - Super High Frequency

r. SIMAN - Simulation Management Protocol.

s. SIMNET - Simulator Network.

t. UHF - Ultra High Frequency.

u. VLF - Very Low Frequency.

v. WAN - Wide-Area Network.

3.2 Application Layer. Layer 7 of the Open Systems Interconnection Model.

3.3 Application Layer Entities. The portion of an application process of concern to the Open Systems Interconnection.

3.4 Application Protocol. A set of rules by which the inter-process communication between corresponding Application Layer entities is accomplished.

3.5 Articulated Part. A visible part of a simulated entity that is able to move independently of the entity itself.

3.6 BAM. Binary Angle Measurement. A method of angle measurement which uses the binary number system. BAMs are defined in the following manner:

> Instead of 360 degrees or 2*pi radians, 32 bits of BAM measures a circle as 2^32 units. Each unit is equivalent to 360/2^32 degrees or 2*pi/2^32 radians. This method is used when integers are required to express angle measure with high precision.

3.7 Big Endian. A method of transmitting data serially where the eight bits of each octet are transmitted on the medium in the order that would be read from left to right. The leftmost bit is the most significant bit (MSB) and is transmitted first. The rightmost bit is the least significant bit (LSB) as is transmitted last. Similarly, when a multi-octet field is transmitted, the most significant octet is transmitted first, from high order to low order.

3.8 Bit. The smallest unit of information in the binary system of notation.

3.9 Broadcast. Part of a datagram service where the datagram is delivered to all nodes on a network.

3.10 Byte. A sequence of consecutive bits operated upon as a unit; an 8-bit segment.

3.11 CCITT. Consultative Committee for International Telephony and Telegraphy; an international standards group of the International Telecommunications Union, which is a specialized agency of the United Nations Organization.

3.12 Computer Network. An interconnection of computer systems, terminals, communications facilities, and data collecting devices.

3.13 Connectionless service. In networking, this term refers to a message service which does not require a connection or relationship to be established between communicating entities before a message can be sent.

3.14 Datagram. A unit of data transferred in the context of a connectionless service.

3.15 Data Link Layer. Layer 2 of the OSI Reference Model.

3.16 Dead reckoning. Estimation of the position of an entity or object based on a previously known position and estimates of time and motion.

3.17 Distributed Interactive Simulation. (DIS); An exercise involving the interconnection of a number of simulation devices in which the simulated entities are able to interact within a computer generated environment. The simulation devices may be present in one location, interconnected by a Local Area Network (LAN) or may be widely distributed on a Wide Area Network (WAN).

3.18 Distributed Simulation. See Distributed Interactive Simulation.

3.19 DRN. Data Representation Notation. A syntax employed in SIMNET architecture to define data structures.

3.20 Emitter. Any device that is part of a simulated entity and able to discharge detectable electromagnetic energy.

3.21 Entity. Elements of a simulated world that are generated and controlled by simulators, such as platforms or life forms. An entity may also be an element of the simulated world that is subject to changes in appearance as a result of the simulation exercise. These may be cultural features such as bridges or buildings.

3.22 Euler Angles. A set of three angles used to describe the orientation of an entity. The angles represent the yaw, pitch, and roll, respectively.

3.23 Exercise. See Simulation Exercise.

3.24 Fidelity. A measure of the realism of a simulation. For example, higher fidelity simulations represent greater detail and more realistic representation of visual and sensor data.

3.25 Fields. A series of contiguous bits treated as an instance of a particular data type that may be part of a protocol data unit.

3.26 Host. See Host Computer.

3.27 Host Computer. A computer attached to a network providing primarily application level services such as computation, data base access, special programs or programming languages. In Distributed Interactive Simulation, the host computer performs the simulation.

3.28 Indirect Fire. Ballistic weapons fire directed at a particular location that may not be within sight.

3.29 Layer. An ISO term used with a descriptive identifier to refer to one part of the OSI Reference Model (e.g. the Application Layer).

3.30 Layering. Separation of functions of a network architecture into distinct levels. These levels communicate individually with like levels in a distant node and with adjacent higher or lower levels in the same node.

3.31 LAN. Local Area Network. A network of computers usually located in the same building interconnected by a communication medium such as Ethernet or Token-ring.

3.32 Long-Haul Network. See Wide Area Network.

3.33 Multicast. Part of a datagram service where the datagram is delivered to a subset of nodes on the network.

3.34 Network Architecture. The organization of system components, functions that these components perform, and their interrelationships; A specification which defines how a system is to be organized. It defines functional modularity as well as protocols and interfaces which allow communication and cooperation among those modules.

3.35 Node. A device which communicates via a Local Area Network or a Wide Area Network. A point in a network where one or more communications lines terminate.

3.36 Octet. A sequence of 8 bits, usually operated upon as an entity.

3.37 Open System. A system which can be interconnected to others according to established standards.

3.38 Open System Architecture. A network architecture standard developed by the ISO.

3.39 OSI. Open Systems Interconnection.

3.40 OSI Reference Model. A model that organizes the data communication concept into seven layers and defines the functionality of each layer. OSI Reference Model for Network Architecture was created by ISO and is used as a reference to compare network architectures.

3.41 Packet. A block of data whose maximum length is fixed. This term is usually used to describe a unit of information exchanged at the Network Layer, or Layer 3, in the OSI reference model.

3.42 PDU. Protocol Data Unit. In the scope of this standard, this refers to the application level messages that are passed on the network between simulators.

3.43 Peer Entity. An entity that is in the same layer as another entity.

3.44 Physical Layer. Layer 1 of the OSI Reference Model.

3.45 Presentation Layer. Layer 6 of the OSI Reference Model.

3.46 Protocol. A formal set of conventions or rules governing the format, timing, and error control to facilitate message exchange between two communicating processes.

3.47 Session Layer. Layer 5 of the OSI Reference Model.

3.48 SIMNET. SIMulator NETwork. A Defense Advanced Research Projects Agency (DARPA) project whose goal was to develop the technology to build a large scale network of interactive combat simulators.

3.49 Simulated Entity. See Entity.

3.50 Simulation Exercise. An activity which uses computers to train individuals in certain skills or evaluate operational equipment within a given scenario.

3.51 Sublayer. A grouping of functions in a layer that makes use of entities and connections of its layer.

3.52 Transport Layer. Layer 4 of the OSI Reference Model.

3.53 WAN. Wide-Area Network. A network of computers that

are located in different buildings or different cities. Sometimes called Long-Haul Network.

3.54 X-Series (X.###). CCITT Recommendations.

4. GENERAL REQUIREMENTS

4.1 Representation of data.

4.1.1 Angle Representation. Angles shall be specified by 32-bit signed integers expressed in binary angle measurement (BAM).

4.1.2 Byte ordering. Byte ordering shall adhere to MIL-STD-1777 Internet Protocol Specification, Appendix A. This method is sometimes referred to as Big Endian.

4.1.3 Enumeration Representation. Enumeration types shall adhere to MIL-STD-1777 Internet Protocol Specification, Appendix A. Double and single precision enumerated types shall begin with 0 in all cases for the first element of the type declaration.

4.1.4 Number Representation. All numbers shall be specified as integer values. These integer values may be signed or unsigned and may have a size of 8, 16 or 32 bits. The most significant bit shall designate the sign bit and shall have a of value 0 for positive numbers and 1 for negative numbers.

4.1.5 Time stamping. Time stamping shall be used to indicate the time at which data is transmitted. This timestamp shall be represented using a 32 bit unsigned integer representing units of time passed since the beginning of the current hour. The scale shall be determined by setting one hour equal to 2^{32} making each unit represent $3600sec/2^{32} = .838$ microsec.

4.2 Basic Data Types and Records.

4.2.1 Angle. The angular measure of entity orientation and articulated parts shall be specified in BAM (see 4.1.1).

4.2.2 Angular Velocity Vector Record. Angular Velocity of simulated entities shall be specified by the Angular Velocity Vector Record. This record shall specify velocity in BAMs per second. This angular velocity shall represent the velocity about a platform's coordinate axis. A North-East-Down platform coordinate axis shall be used. Each of the angular rates shall be represented as a 32 bit signed integer.

The Angular Velocity record is represented in Figure 4-1:

Yaw Rate	32 bit signed integer
Pitch Rate	32 bit signed integer
Roll Rate	32 bit signed integer

FIGURE 4-1. **Angular Velocity Vector Record**

4.2.3 Articulated Part Record. The orientation of articulated parts shall be specified by an Articulated Part Record. The first field of this record shall be specified by a 16 bit unsigned integer representing the number of articulated parts. Based on the number of articulated parts specified by the first field the remainder of this record shall consist of an array of 16-bit integers. The first octet in each array element shall represent the azimuth of the part in units of BAM. The second octet in each array element shall represent the elevation of the part in units of BAM.

The Articulated Part record is represented in Figure 4-2:

Number of Articulated Parts	16 bit uns int
Articulated Part #1	Azimuth: 8 bit BAM Elevation: 8 bit BAM
Articulated Part #2	Azimuth: 8 bit BAM Elevation: 8 bit BAM
.	.
.	.
.	.
Articulated Part #n	Azimuth: 8 bit BAM Elevation: 8 bit BAM

FIGURE 4-2. **Articulated Part Record**

4.2.4 Boolean. A boolean data type shall be represented as a single bit representing a true-false value. This bit shall represent an enumeration type of one bit, where the value 0 is interpreted as "false", and 1, as "true".

4.2.5 Burst Descriptor Record. The firing of a round or a burst of ammunition shall be represented by a burst descriptor record. This record shall specify the type of munition fired, the type detonator or fuze, the number of rounds fired, and the rate at which the rounds are fired in rounds per second. The fields of this record are described below:

4.2.5.1 Munition and Detonator. Munition and detonator each shall be specified by an ENTITY TYPE defined in 4.2.10.

4.2.5.2 Quantity and Rate. Quantity and rate each shall be specified by 16 bit unsigned integers. Quantity shall represent the number of rounds fired in the burst and rate shall represent the rounds per second for the munition specified. For Quantity equal to one, the rate field shall contain zero.

The Burst Descriptor record is represented in Figure 4-3:

Munition	Entity Type 32 bit uns int
Detonator	Entity Type 32 bit uns int
Quantity	16 bit uns int
Rate	16 bit uns int

FIGURE 4-3. **Burst Descriptor Record**

4.2.6 Emitter Type Record. The types of emitters an entity has shall be specified by an Emitter type record. This record shall specify the number of emitters, the database which describes that emitter, the emitter class, the mode number for that emitter, and the database entry number. Each simulator shall contain detailed emitter information in a database. The fields of this record are described below:

4.2.6.1 Number of emitters. The number of active emitters shall be specified by an 8 bit unsigned integer.

4.2.6.2 Database Number. The database number shall be specified by an 8 bit unsigned integer, and shall represent the particular database pertaining to the emitter(s) of interest.

Values defined for Database Number are:

0 Other
1 UTSS

4.2.6.3 Emitter Class. The emitter class shall be specified by an 8 bit enumeration and defined according to Table I.

TABLE I. **Electromagnetic Spectrum: Emitter Classes**

Class Number	Region	Center Wavelength
0	Other	--------
1	Sound	--------
2	Infrasonic	10^9 m
3	Sonic and VLF	10^6 m
4	Ultrasonic and LF	10^4 m
5	Radio and HF	100 m
6	Television and UHF	1 m
7	Radar and SHF	100 milli-m
8	Experimental and EHF	1 milli-m
9	Infrared	10-100 micro-m
10	Visible	1000 nano-m
11	Ultraviolet	10 nano-m
12	X Ray	100 pico-m
13	Gamma Ray	1 pico-m
14	Secondary Cosmic Ray	0.01 pico-m

4.2.6.4 Mode Number. The mode number shall be specified by an 8 bit unsigned integer. It shall represent the mode of a particular emitter as listed in the referenced emitter data base.

4.2.6.5 Database Entry Number. The database entry number shall be specified by a 16 bit unsigned integer. It shall represent the number associated with the particular type of emitter.

The Emitter Type record is represented in Figure 4-4:

Number of Emitters	8 bit Unsigned Integer
Database Number	8 bit unsigned integer
Database Access Information (for each emitter)	**Emitter Class:** 8 bit enumeration **Mode Number:** 8 bit unsigned integer **Database Entry #:** 16 bit unsigned integer

FIGURE 4-4. **Emitter Type Record**

4.2.7 Entity Capabilities Record. The capabilities of an entity shall be specified by an Entity Capabilities record. This record shall be defined as a 32 bit record of Boolean types. The values defined for this record are included in Figure 4-5:

Bit 1	Bit 2	Bit 3	Bit 4	Bits 5 - 32
Ammunition Supply Capability	**Fuel Supply Capability**	**Recovery Capability**	**Repair Capability**	Additional Capabilities to be defined

FIGURE 4-5. **Entity Capabilities Record**

4.2.8 Entity Identifier Record. The unique identification of each entity in an exercise shall be specified by an Entity Identifier Record. This identification number shall consist of a Simulation Address (see 4.2.8.1) and a simulated entity identification number. The fields of this record are described below:

4.2.8.1 Simulation Address. An entity's simulation address shall be specified by a Simulation Address Record. A Simulation Address Record shall consist of the site identification number and the host identification number. These fields are described below:

4.2.8.1.1 Site Identifier. The site identification number shall be assigned by the authority initiating the simulation exercise. This identifier shall be specified by a 16 bit unsigned integer.

4.2.8.1.2 Host Identifier. The host identification number shall be assigned by the authority managing a particular site. This identifier shall be specified by a 16 bit unsigned integer.

The Host Identifier is represented in Figure 4-6:

Site Identifier	16 bit unsigned integer
Host Identifier	16 bit unsigned integer

FIGURE 4-6. **Simulation Address Record**

4.2.8.2 Entity Identification Number. Each entity participating in an exercise shall have a unique entity number that is assigned by the host simulating that entity. This number shall be represented using a 16 bit unsigned integer.

The Entity Identifier record is represented in Figure 4-7:

Simulation Address	Site Address: Host Address:	16 bit unsigned integer 16 bit unsigned integer
Entity Identification Number	16 bit unsigned integer	

FIGURE 4-7. **Entity Identifier Record**

4.2.9 Entity Marking. Entity markings shall be specified by a string of text. The text shall use the ASCII character set and shall be represented by a 12 element character string.

4.2.10 Entity Type. Entity types shall be specified using a 32 bit unsigned integer. Interpretation of the 32 bits is given in Appendix B1 and B2.

4.2.11 Euler Angles Record. Euler angles shall be specified by the Euler Angles Record. This record shall specify three angles representing yaw, pitch, and roll, in that order. A North-East-Down platform coordinate axis shall be used. These angles shall be in terms of the entity's coordinate system. The three angles shall be specified by a 32 bit signed integer of BAM.

The Euler Angles record is represented in Figure 4-8:

Yaw angle	32 bit BAM
Pitch angle	32 bit BAM
Roll angle	32 bit BAM

FIGURE 4-8. **Euler Angles Record**

4.2.12 Event Identifier. Event identification shall be specified by a 16 bit unsigned integer. The event identifier shall be assigned by the host computer initiating the related sequence of events.

4.2.13 Exercise Identifier. Exercise identification shall be specified by an 8 bit unsigned integer value. It shall be assigned by the authority initiating the simulation exercise.

4.2.14 Linear Acceleration Vector Record. Linear acceleration shall be specified by a Linear Acceleration Vector Record. This record shall represent linear acceleration as a vector with x, y, and z components. x, y, and z shall represent directions of the world coordinate axis. This vector shall represent acceleration in millimeters per second squared. A 32 bit signed integer shall represent the acceleration for each vector component.

The Linear Acceleration Vector record is represented in Figure 4-9:

X - Component	32 bit signed integer
Y - Component	32 bit signed integer
Z - Component	32 bit signed integer

FIGURE 4-9. **Linear Acceleration Vector Record**

4.2.15 Linear Velocity Vector Record. Linear velocity shall be specified by a Linear Velocity Vector Record. This record shall represent linear velocity as a vector with x, y, and z components. x, y, and z shall represent directions of the world coordinate axes. This vector shall represent velocity in millimeters per second. A 32 bit signed integer shall represent the velocity for each vector component.

The Linear Velocity Vector record is represented in Figure 4-10:

X - component	32 bit signed integer
Y - component	32 bit signed integer
Z - component	32 bit signed integer

FIGURE 4-10. **Linear Velocity Vector Record**

4.2.16 Organizational Unit Record. The organizational unit to which a simulated entity belongs shall be specified by the Organizational Unit Record. This record shall contain fields specifying the force, country, and service branch to which the entity belongs as defined in Appendix E. It shall specify a particular unit by using a hierarchy which depends on the information in the force, country, and service branch fields. These fields are described below:

4.2.16.1 Force ID. This field shall specify the highest level organizational component. This field shall be specified by an 8 bit enumeration.

4.2.16.2 Country ID. This field shall identify the country to which the unit belongs. The Country ID shall be specified by an 8 bit enumeration.

4.2.16.3 Service ID. This field shall specify the military service to which the unit belongs. The Service ID shall be specified by an 8 bit enumeration.

4.2.16.4 Hierarchy. This field shall describe the unit number and the type of unit associated with each organization level applicable to the entity. Unit types shall be defined according to the service to which the unit belongs. Unit numbers shall be defined for each of the eight unit types. Each level shall consist of an 8 bit unsigned integer for the unit number at that level. Specific unit types for each service are defined in Appendix E.

The Organizational Unit record is represented in Figure 4-11:

Force	Force ID: 8 bit enumeration type
Country	Country ID: 8 bit enumeration
Service	Service ID: 8 bit enumeration
Hierarchy	8 levels are defined. The levels depend on the Service ID. Each level consists of: Unit Number: 8 bit unsigned integer

FIGURE 4-11. **Organizational Unit Record**

4.2.17 Repair Type. Repair Types shall be specified by a 16 bit unsigned integer. Interpretation of the 16 bits is given in Appendix C.

4.2.18 Service Type. Service Type shall be specified by an 8 bit enumeration. Values shall be defined as:

0 Other
1 Resupply
2 Repair
3 Tow
4 Rescue

4.2.19 Supply Quantity Record. Supply quantity shall be represented by the Supply Quantity Record. This record shall contain fields specifying the type of supply and the quantity of that supply. These fields are described below:

4.2.19.1 Supply Type. The Supply Type field shall be specified by a Munitions Entity Type (see 4.2.10 and Appendix B1).

4.2.19.2 Quantity. The Quantity field shall be specified by a 32 bit unsigned integer.

The Supply Quantity record is represented in Figure 4-12:

Supply Type	Entity Type: 32 bit unsigned integer
Quantity	32 bit unsigned integer

FIGURE 4-12. **Supply Quantity Record**

4.2.20 Terrain Database Identifier Record. Identification of the terrain database shall be accomplished using the Terrain Database Identifier record. This identifier shall be specified by an 11 element character string representing the terrain database name and an 8 bit unsigned integer representing the version number. The terrain database name shall be specified using the ASCII character set.

The Terrain Database Identifier record is represented in Figure 4-13:

Terrain Database Name	11 element character string
Version Number	8 bit unsigned integer

FIGURE 4-13. **Terrain Database Identifier Record**

4.2.21 Timestamp. The timestamp shall be specified using a 32 bit unsigned integer representing time passed since the beginning of the current hour (see 4.1.5).

4.2.22 World Coordinates Record. Location shall be specified by a set of three coordinates, x, y, and z. The origin of this coordinate system shall be the centroid of the earth, with the x axis passing through the Prime Meridian at the equator, the y axis passing through 90 degrees East longitude at the equator, and the z axis passing through the north pole, . These coordinates shall represent centimeters from the centroid of the earth. A 32 bit signed integer shall represent the location for each coordinate.

The World Coordinates record is represented in Figure 4-14:

X - Coordinate	32 bit signed integer
Y - Coordinate	32 bit signed integer
Z - Coordinate	32 bit signed integer

FIGURE 4-14. **World Coordinates Record**

4.3 Protocol Data Units for Distributed Interactive Simulation

4.3.1 Introduction. This section lists and describes the Protocol Data Units required by this standard.

4.3.2 List of DIS Protocol Data Units.

I. Entity Information
   A. Entity Appearance PDU

II. Entity Interaction
   A. Weapons Fire
      1. Fire PDU
      2. Detonation PDU

   B. Update Rate Control
      1. Update Request PDU
      2. Update Response PDU

   C. Logistics Support
      1. Service Request PDU
      2. Service Cancel PDU
      3. Service Complete PDU
      4. Resupply Offer PDU
      5. Repair Offer PDU

   D. Collisions
      1. Collision PDU

   E. Electronic Interaction
      1. Emitter PDU

III. Environment Information
      none

IV. DIS Management[1]
   A. Activation
      1. Activate Request PDU
      2. Activate Response PDU

   B. Deactivation
      1. Deactivate Request PDU
      2. Deactivate Response PDU

---

[1] These PDUs are not within the scope of this standard but are included as a recommendation until protocol for Simulation Management is defined.

4.3.3 Protocol Data Unit Header. A protocol data unit (PDU) header shall precede all protocol data units. The header shall specify the identification number of the exercise, and the type of protocol data unit that follows. These fields are described below:

4.3.3.1 Exercise Identification. This field shall specify the exercise to which the PDU pertains. This field shall be represented by an EXERCISE IDENTIFIER (see 4.2.13).

4.3.3.2 Protocol Data Unit Kind. This field indicates the type of PDU that follows. This field shall be represented by an 8 bit enumeration. The defined values are:

0	Activate Request PDU
1	Activate Response PDU
2	Deactivate Request PDU
3	Deactivate Response PDU
4	Entity Appearance PDU
5	Emitter PDU
6	Fire PDU
7	Detonation PDU
8	Collision PDU
9	Service Request PDU
10	Service Cancel PDU
11	Service Complete PDU
12	Resupply Offer PDU
13	Repair Offer PDU
14	Update Request PDU
15	Update Response PDU

This PDU header is represented in Figure 4-15.

FIELD SIZE (bits)	PROTOCOL DATA UNIT HEADER FIELDS	
8	EXERCISE IDENTIFIER	8 bits uns int
8	PROTOCOL DATA UNIT KIND	8 bit enum
16	PADDING	16 bits unused

FIGURE 4-15. Protocol Data Unit Header

4.3.4 Entity Information.

4.3.4.1 ENTITY APPEARANCE PDU. Appearance information for an entity shall be communicated by issuing an Entity Appearance PDU. This PDU shall be issued by a simulator when the following conditions exist:

a. The discrepancy between an entity's actual appearance and its dead reckoned appearance exceeds a predetermined threshold. See 4.3.5.2 on UPDATE RATE CONTROL for more information on control of the threshold value.

b. A predetermined amount of time has elapsed since the issuing of the last PDU.

The Entity Appearance PDU shall contain the following static and dynamic information:

4.3.4.1.1 Static Entity Information.

a. **Entity Identification.** This field shall identify each entity participating in the simulation exercise. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Entity Type.** This field shall identify the entity type. This shall be represented by a 32 bit unsigned integer. The interpretation of this field is found in Appendices B1 and B2.

c. **Marking.** This field shall identify any unique markings on an entity (e.g. a bumper number or country symbol). This shall be represented by an ENTITY MARKING (see 4.2.9).

d. **Capabilities.** This field shall specify the entity's capabilities. This shall be represented by an ENTITY CAPABILITIES record (see 4.2.7).

4.3.4.1.2 Dynamic Entity Information.

a. **Time of Issue.** This field shall specify the time at which the PDU was issued. This shall be represented by a TIMESTAMP (see 4.2.21).

b. **Entity Appearance.** This field shall specify the dynamic changes to the entity's attributes. This shall be represented by a 32 bit unsigned integer. The description of this 32 bit field is defined in Appendix D.

c. **Entity Location.** This field shall specify an entity's physical location in the simulated world. This shall be represented by a WORLD COORDINATES record (see 4.2.22).

d. **Entity Velocity.** This field shall specify an entity's linear velocity. This shall be represented by a LINEAR VELOCITY VECTOR record (see 4.2.15).

e. **Entity Acceleration.** This field shall specify an entity's acceleration. This shall be represented by a LINEAR ACCELERATION VECTOR record (see 4.2.14).

f. **Entity Orientation.** This field shall specify an entity's orientation. This field shall be represented by an EULER ANGLES record (see 4.2.11).

g. **Entity Angular Velocity.** This field shall specify an entity's angular velocity. This field shall be represented by an ANGULAR VELOCITY VECTOR record (see 4.2.2).

h. **Articulated Parts.** This field shall specify the orientation of each articulated part. This shall be represented by an ARTICULATED PART record (see 4.2.3).

This PDU is represented in Figure 4-16.

FIELD SIZE (bits)	ENTITY APPEARANCE PDU FIELDS	
48	ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
16	PADDING	16 bits unused
32	ENTITY TYPE	32 bits uns int
96	ENTITY MARKING	Entity Marking - 12 element character string
32	ENTITY CAPABILITIES	ENTITY CAPABILITIES - 32 bits, boolean characters
32	TIME OF ISSUE	TIME STAMP - 32 bit uns int
32	ENTITY APPEARANCE	APPEARANCE - 32 bit uns int
96	ENTITY LOCATION	X COORDINATE - 32 bit signed integer
		Y COORDINATE - 32 bit signed integer
		Z COORDINATE - 32 bit signed integer
96	ENTITY VELOCITY	X COMPONENT - 32 bit signed integer
		Y COMPONENT - 32 bit signed integer
		Z COMPONENT - 32 bit signed integer

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FIGURE 4-16. Entity Appearance PDU

96	ENTITY ACCELERATION	X COMPONENT-32 bit signed integer
		Y COMPONENT-32 bit signed integer
		Z COMPONENT-32 bit signed integer
96	ENTITY ORIENTATION	YAW ANGLE - 32 bit BAM
		PITCH ANGLE - 32 bit BAM
		ROLL ANGLE - 32 bit BAM
96	ENTITY ANGULAR VELOCITY	YAW RATE - 32 bit signed integer
		PITCH RATE - 32 bit signed integer
		ROLL RATE - 32 bit signed integer
16+(N)(16) (N = Number of Articulated Parts)	ARTICULATED PARTS	#articulated parts*-16 bits uns int
		Part 1 AZIMUTH - 8 bit BAM Part 1 ELEVATION - 8 bit BAM Part 2 AZIMUTH - 8 bit BAM Part 2 ELEVATION - 8 bit BAM • • • Part N AZIMUTH - 8 bit BAM Part N ELEVATION - 8 bit BAM

* NOTE:
For even numbers of articulated parts, a 16 bit padding shall be added to maintain 32 bit boundaries.

FIGURE 4-16. Entity Appearance PDU (cont)

4.3.5 Entity Interaction.

4.3.5.1 Weapons Fire.

4.3.5.1.1 FIRE PDU. The firing of a weapon shall be communicated by issuing a FIRE PDU. A FIRE PDU shall specify the type of munition fired, the location of the weapon from which it was fired, and the velocity of the munition. This PDU shall also specify the target range used for the fire control system and the kind of munition selected. The following fields describe the FIRE PDU:

a. **Event Identification.** This field shall contain a number generated by the firing simulator to associate related events. This shall be represented by an EVENT IDENTIFIER (see 4.2.12).

b. **Firing Entity Identification.** This field shall identify the firing simulator. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

c. **Target Identification.** This field shall identify the intended target. If this FIRE PDU represents indirect Fire, this field shall contain zeros. This field shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

d. **Munition Identification.** This field shall identify a munition as a unique entity. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

e. **Burst Descriptor.** This field shall describe the type of munition fired, the quantity, and rate. This field shall be represented by a BURST DESCRIPTOR record (see 4.2.5).

f. **Location.** This field shall specify the location from which the munition was launched. This field shall be represented by a WORLD COORDINATES record (see 4.2.22).

g. **Velocity Vector.** This field shall specify speed and direction of the fired munition. This shall be represented by a LINEAR VELOCITY VECTOR record (see 4.2.15).

h. **Range.** This field shall specify the range (in centimeters) that an entity's fire control system has assumed in computing the ballistic solution. This field shall be represented as a 32 bit unsigned integer.

This PDU is represented in Figure 4-17.

FIELD SIZE (bits)	FIRE PDU FIELDS	
16	EVENT ID	16 bit uns int
48	FIRING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	TARGET ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	MUNITION ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
96	BURST DESCRIPTOR	MUNITION - 32 bit uns int
		DETONATOR - 32 bit uns int
		QUANTITY - 16 bit uns int
		RATE - 16 bit uns
96	LOCATION	X COORDINATE - 32 bit signed integer
		Y COORDINATE - 32 bit signed integer
		Z COORDINATE - 32 bit signed integer
96	VELOCITY VECTOR	X COORDINATE - 32 bit signed integer
		Y COORDINATE - 32 bit signed integer
		Z COORDINATE - 32 bit signed integer
32	RANGE	32 bit uns int

FIGURE 4-17. Fire PDU

4.3.5.1.2 DETONATION PDU. The detonation of munitions shall be communicated by issuing a DETONATION PDU. A DETONATION PDU shall be issued when the trajectory of the fired munition has terminated. This PDU shall specify the event identification number, the firing entity's identification number, the type, quantity and rate of the munition detonating, the munition's identification number, the velocity of the munition before impact and the location of impact. The following fields describe the DETONATION PDU:

a. **Event Identification.** This field shall contain the same number as the event identifier of the FIRE PDU that communicated the launch of the munition. This field shall be represented by an EVENT IDENTIFIER (see 4.2.12).

b. **Firing Entity Identification.** This field shall identify the firing entity. This field shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

c. **Time of Detonation.** This field describes the time at which the detonation took place. This is represented by a TIMESTAMP (see 4.2.21).

d. **Burst Descriptor.** This field shall describe the type of munition fired, quantity and rate. This shall be represented by a BURST DESCRIPTOR record (see 4.2.5).

d. **Munition Identification.** This field shall specify the ENTITY ID for the munition. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

e. **Velocity.** This field shall specify the velocity of the munition immediately before detonation. This shall be represented by a LINEAR VELOCITY VECTOR record (see 4.2.15).

f. **Location.** This field shall specify the location of detonation. This shall be represented by a WORLD COORDINATES record (see 4.2.22).

This PDU is represented in Figure 4-18.

FIELD SIZE (bits)	DETONATION PDU FIELDS	
16	EVENT ID	16 bit uns int
48	FIRING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
32	TIME OF DETONATION	32 bit uns int
96	BURST DESCRIPTOR	MUNITION - 32 bit uns int
		DETONATOR - 32 bit uns int
		QUANTITY - 16 bit uns int
		RATE - 16 bit uns int
48	MUNITION ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
16	PADDING	16 bits unused
96	VELOCITY VECTOR	X COORDINATE - 32 bit signed integer
		Y COORDINATE - 32 bit signed integer
		Z COORDINATE - 32 bit signed integer
96	LOCATION	X COORDINATE - 32 bit signed integer
		Y COORDINATE - 32 bit signed integer
		Z COORDINATE - 32 bit signed integer

FIGURE 4-18. Detonation PDU

4.3.5.2 Update Rate Control.

4.3.5.2.1 UPDATE REQUEST PDU. A request for a change in the rate at which a simulator issues Appearance and Emitter PDUs shall be communicated by an UPDATE REQUEST PDU. This PDU shall specify the identification numbers of the issuing entity and the entity for which the PDU is intended. It shall also specify the kind of PDU whose update rate is to be changed, the threshold value that will determine when the PDU is issued, and the time period for which the new update rate is to be maintained. The following information shall be contained in an UPDATE REQUEST PDU.

a. **Issuing Entity Identification.** This field shall identify the entity that is requesting the update rate change. This field shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Changing Entity Identification.** This field shall identify the entity requested to change its update rate. This field shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

c. **PDU Kind.** This field shall specify the PDU whose rate of issue is to be changed. This shall be represented by an 8 bit enumeration and shall be defined by the following values.

0	Other
1	Appearance PDU
2	Emitter PDU

d. **Threshold.** This field shall specify the size of the allowable discrepancy. This field shall contain two threshold types: Linear and Rotational. These are described below.

1. **Linear Threshold.** This field shall specify the discrepancy threshold as length in centimeters and shall express it in terms of world coordinates. There shall be three fields associated with this record: x-threshold, y-threshold and z-threshold. Each shall be a 32-bit unsigned integer.

2. **Rotational Threshold.** This field shall specify the discrepancy threshold as an angle of rotation in BAMs. This field shall be represented by an EULER ANGLES record (see 4.2.11).

e. **Duration of Change.** This field shall specify the duration in seconds of the new update rate. This field shall be represented as a 32 bit unsigned integer.

This PDU is represented in Figure 4-19.

FIELD SIZE (bits)	UPDATE REQUEST PDU FIELDS	
48	ISSUING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	CHANGING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
8	PDU Kind	8 bit enum
24	Padding	24 bits unused
192	LINEAR THRESHOLD	X THRESHOLD - 32 bit uns int
		Y THRESHOLD - 32 bit uns int
		Z THRESHOLD - 32 bit uns int
	ROTATIONAL THRESHOLD	YAW ANGLE - 32 bit BAM
		PITCH ANGLE - 32 bit BAM
		ROLL ANGLE - 32 bit BAM
32	DURATION OF CHANGE	32 bit uns int

Figure 4-19. Update Request PDU

4.3.5.2.2 UPDATE RESPONSE PDU. Response to an UPDATE REQUEST PDU shall be communicated by issuing an UPDATE RESPONSE PDU. The following information shall be contained in an Update Response PDU.

a. **Responding Entity Identification.** This field shall identify the entity that is responding to the update change request. This field shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Update Change Result.** This field shall specify the result of the update request. This field shall be represented as an 8 bit enumeration and shall be defined by the following results:

0	Other
1	Change has been accepted and will be implemented
2	Change is inappropriate
3	Change will not be implemented

This PDU is represented in Figure 4-20.

FIELD SIZE (bits)	UPDATE RESPONSE PDU FIELDS	
48	RESPONDING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
8	RESULT	8 bit enum
8	PADDING	8 bits unused

FIGURE 4-20. Update Response PDU

4.3.5.3 Logistic Support.

4.3.5.3.1 SERVICE REQUEST PDU. A request for logistics support shall be communicated by issuing a SERVICE REQUEST PDU. This PDU shall identify the requesting entity, the supplying entity, and the service type that is requested. A SERVICE REQUEST PDU shall consist of the following fields:

a. **Requesting Entity Identification.** This field shall identify the entity that is requesting the service. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Supplying Entity Identification.** This field shall identify the entity that is able to provide the service requested. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

c. **Service Type Requested.** This field shall describe the type of service being requested. This shall be represented by a SERVICE TYPE (see 4.2.18).

This PDU is represented in Figure 4-21.

FIELD SIZE (bits)	SERVICE REQUEST PDU FIELDS	
48	REQUESTING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	SUPPLYING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
8	SERVICE TYPE	8 bit enum
24	PADDING	24 bits unused

FIGURE 4-21. Service Request PDU

4.3.5.3.2 SERVICE CANCEL PDU. The canceling of a service function by either the receiving or the supplying entity shall be communicated by issuing a SERVICE CANCEL PDU.. If a resupply service has been canceled prior to completion, no supplies are transferred. A SERVICE CANCEL PDU shall contain the following fields:

a. **Receiving Entity Identification.** This field shall identify the entity that has requested the service. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Supplying Entity Identification.** This field shall identify the supplying entity. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

This PDU is represented in Figure 4-22.

FIELD SIZE (bits)	SERVICE CANCEL PDU FIELDS	
48	RECEIVING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	SUPPLYING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int

FIGURE 4-22. Service Cancel PDU

4.3.5.3.3 SERVICE COMPLETE PDU. The result of a service function shall be communicated by issuing a SERVICE COMPLETE PDU. A SERVICE COMPLETE PDU shall contain the following fields:

a. **Requesting Entity Identification.** This field shall identify the entity that requested the service. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Supplying Entity Identification.** This field shall identify the supplying entity. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

c. **Service Type.** This field shall specify the type of service provided. This shall be represented by a SERVICE TYPE (see 4.2.18).

d. **Result of Service.** This field shall specify the result of the service activity. It shall be represented by an 8 bit enumeration. Reasons for a service completion shall be defined as follows:

0 service completed
1 invalid service
2 service interrupted

This PDU is represented in Figure 4-23.

FIELD SIZE (bits)	SERVICE COMPLETE PDU FIELDS	
48	REQUESTING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	SUPPLYING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
8	SERVICE TYPE	8 bit enum
8	RESULT OF SERVICE	8 bit enum
16	PADDING	16 bits unused

FIGURE 4-23. Service Complete PDU

4.3.5.3.4 RESUPPLY OFFER PDU. Response by an identified supplier to a SERVICE REQUEST PDU for supplies shall be communicated by issuing a RESUPPLY OFFER PDU. This PDU shall list the supplies the issuing entity has to offer. A RESUPPLY OFFER PDU shall contain the following fields:

a. **Requesting Entity Identification.** This field shall identify the entity that is requesting supplies. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Supplying Entity Identification.** This field shall identify the supplying entity. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

c. **Number of Supplies.** This field shall describe the number of different supplies types that the supplier can offer. This shall be represented by an 8 bit unsigned integer.

d. **Supplies Available and Amounts.** This field shall list the supply types that are available and the amounts of each type. This shall be represented as an array of SUPPLY QUANTITY record (see 4.2.19).

This PDU is represented in Figure 4-24.

FIELD SIZE (bits)	RESUPPLY OFFER PDU FIELDS	
48	REQUESTING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	SUPPLYING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
8	# OF SUPPLIES	8 bit uns int
24	PADDING	24 bits unused
N(64) (N=# of supplies)	SUPPLY TYPE	32 bit uns int
	QUANTITY	32 bit uns int

FIGURE 4-24. Resupply Offer PDU

4.3.5.3.5 REPAIR OFFER PDU. Response to a SERVICE REQUEST PDU for repairs shall be communicated by issuing a REPAIR OFFER PDU. This PDU shall list the repairs that the issuer is able to perform. A REPAIR OFFER PDU shall contain the following fields:

a. **Requesting Entity Identification.** This field shall identify the entity that is requesting repairs. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Repairing Entity Identification.** This field shall identify the supplying entity. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

c. **List of Valid Repairs.** This field shall describe the valid repair types. This shall be represented by a REPAIR TYPE (see 4.2.17 and Appendix C).

This PDU is represented in Figure 4-25.

FIELD SIZE (bits)	REPAIR OFFER PDU FIELDS	
48	REQUESTING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	REPAIRING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
16	VALID REPAIRS	REPAIR TYPE-16 bits uns int
16	PADDING	16 bit unused

FIGURE 4-25. Repair Offer PDU

4.3.5.4 Collisions.

4.3.5.4.1 COLLISION PDU. Collisions between entities shall be communicated by issuing a COLLISION PDU. A COLLISION PDU shall contain the following fields:

a. **Issuing Entity Identification.** This field shall identify the entity that is issuing the PDU. This field shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Identification of Colliding Entity.** This field shall identify the entity which has collided with the issuing entity. This field shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

This PDU is represented in Figure 4-26.

FIELD SIZE (bits)	COLLISION PDU FIELDS	
48	ISSUING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int
48	COLLIDING ENTITY ID	SITE ID - 16 bit uns int
		HOST - 16 bit uns int
		ENTITY - 16 bit uns int

FIGURE 4-26. Collision PDU

4.3.5.5 Electronic Interaction.

4.3.5.5.1 EMITTER PDU. The Emitter PDU shall be issued by a simulator when the following conditions exist:

1. The discrepancy between an entity's actual location and its dead reckoned location exceeds a predetermined threshold. See 4.3.5.2 on UPDATE RATE CONTROL for more information on control of the threshold value.

2. A predetermined amount of time has elapsed since the issuing of the last PDU.

3. An emitter changes modes.

All simulators that require emitter information shall have a database of information concerning the capabilities of certain types of emitters. Each EMITTER PDU shall provide information about the state of all of an entity's emitters for a particular database. If an emitter from another database is activated or deactivated, a separate EMITTER PDU shall be issued. An EMITTER PDU shall contain the following fields:

a. **Emitting Entity Identification.** This field shall identify the entity that is issuing the EMITTER PDU. This shall be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Entity Type.** This field shall identify the entity type. This shall be represented by a 32 bit unsigned integer. The interpretation of this field is found in Appendices B1 and B2.

c. **Time of Emission.** This field shall describe the time at which the PDU was issued. This shall be represented by a TIMESTAMP (see 4.2.21).

d. **Location.** This field shall describe the location of the issuing entity. This shall be represented by a WORLD COORDINATES record (see 4.2.22).

e. **Emitter Type.** This field shall specify the number of emitters, the class, the database name and entry number, and the mode number for each emitter. This shall be represented by an EMITTER TYPE record (see 4.2.6).

This PDU is represented in Figure 4-27.

FIELD SIZE (bits)	EMITTER PDU FIELDS	
48	EMITTING ENTITY ID	SITE ID-16 bit uns int
		HOST-16 bit uns int
		ENTITY-16 bit uns int
16	PADDING	16 bits unused
32	ENTITY TYPE	32 bit uns int
32	TIME OF EMISSION	TIME STAMP-32 bit uns int
96	EMITTER LOCATION	X COORDINATE-32 bit signed integer
		Y COORDINATE-32 bit signed integer
		Z COORDINATE-32 bit signed integer
32+N(32) (N=# OF EMITTERS)	# OF EMITTERS	16 bits uns int
	DATABASE #	16 bits uns int
	DATABASE ACCESS INFORMATION (FOR EACH EMITTER)	CLASS-8 bit enum int
		DBASE ENTRY#-16 bit uns int
		MODE#: 8 bit uns int

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FIGURE 4-27. Emitter PDU

4.3.6 DIS Management.

4.3.6.1 Interim Protocol. For DIS it is necessary to provide a means to introduce simulated entities into a simulation and to remove them. This is a DIS management function. Since DIS management protocol is not within the scope of this standard, an activate/deactivate function is recommended but not required.

4.3.6.2 ACTIVATION.

4.3.6.2.1 ACTIVATE REQUEST PDU. Introduction of an entity to a simulation exercise should be performed by issuing an ACTIVATE REQUEST PDU. The ACTIVATE REQUEST PDU should contain the following fields:

a. **Entity ID.** This field should identify the entity. This field should be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Time.** This field should specify the time of the simulation exercise. This should be represented by a TIMESTAMP (see 4.2.21).

c. **Reason.** This field should give the reason for activating an entity. This should be represented by an activate reason type described below.

Activate Reason. Activate Reason should be represented as an 8 bit enumeration. Five reasons for activating a entity should be used:

0 Other
1 Exercise Start
2 Exercise Restart
3 Exercise Entry
4 Entity Reconstitution
5 Towing Arrival

d. **Stores.** This field should describe the amount and types of stores of the given entity. This field should be represented by a STORES DATA TYPE shown below:

Stores Data Type. This type shall be described by two fields:

Number of Stores - This field should be an 8 bit unsigned integer describing the quantity of stores. The representation of quantity depends on the type of store.

Store Type - This field should describe the type of store. It should be represented by the ENTITY TYPE Munition (See 4.2.10 and Appendix B1 and B2).

e. **Terrain Database ID.** This field should identify the terrain database being used for this exercise. This field should be represented by a TERRAIN DATABASE IDENTIFIER (see 4.2.20).

f. **Entity Type.** This field should describe the type of entity (platform, life form, etc.) being activated, and should be represented by an ENTITY TYPE (see 4.2.10).

g. **Unit.** This field should identify the unit an entity is associated with. This should be represented by an ORGANIZATIONAL UNIT record (see 4.2.16).

h. **Marking.** This field should identify any unique markings on an entity (e.g. a bumper number or country symbols). This field should be represented by an ENTITY MARKING (see 4.2.9).

i. **Capabilities.** This field should identify the entity capabilities. This should be represented by an ENTITY CAPABILITIES record (see 4.2.7).

j. **Emitters.** This field should indicate the number and types of emitters this entity has. This should be represented by an EMITTER TYPE (see 4.2.6).

k. **Location.** This field should specify the location for the new entity in world coordinates. This field should be represented by a WORLD COORDINATES record (see 4.2.22).

l. **Orientation.** This field should describe the entity's orientation in terms of three angles. This field should be represented by an EULER ANGLES record (see 4.2.11).

m. **Articulated Parts.** This field should describe the orientation of each articulated part. This field should be represented by an ARTICULATED PART record (see 4.2.3).

This PDU is represented in Figure 4-28.

FIELD SIZE (bits)	ACTIVATE REQUEST PDU FIELDS	
48	ENTITY ID	SITE 16 bits uns int
		HOST 16 bit uns int
		ENTITY 16 bits uns int
16	PADDING	16 bits unused
32	TIME	32 bits uns int
8	REASON	8 bits enum
16	PADDING	16 bit unused
40	STORES	# of stores-8 bits uns int
		ENTITY TYPE MUNITION 32 bit uns int
96	TERRAIN D-BASE ID	12 element character string
32	ENTITY TYPE	32 bit uns int
96	UNIT	FORCE-8 bit enum
		COUNTRY-8 bit enum
		SERVICE-8 bit enum
		8 bits unused
		HIERARCHY-(8)(8 bits uns int)
96	MARKING	12 element character string
32	ENTITY CAPABILITIES	32 bits boolean characters
96	ENTITY LOCATION	X COORDINATE-32 bit signed integer
		Y COORDINATE-32 bit signed integer
		Z COORDINATE-32 bit signed integer
32+D[32+ N(32)] (D=# of Dbases N=# of emitters)	# of databases	8 bits ins int
	Padding	24 bits unused
	Dbase info (for each emitter)	# of emitters-16 bit uns int
		Dbase #: 16 bit uns int
	Dbase access info (for each emitter)	class-8 bit enum
		mode #: 8 bit uns int
		Dbase entry#-16 bit uns int

FIGURE 4-28. Activate Request PDU

FIELD SIZE (bits)	ACTIVATE REQUEST PDU FIELDS (CONT)	
96	ENTITY ORIENTATION	YAW ANGLE-32 bit BAM
		PITCH ANGLE 32 bit BAM
		ROLL ANGLE 32 bit BAM
16+(N)(16) (N=Number of Articulated Parts)	ARTICULATED PARTS	# art part-16 bit uns int*
		Part 1 AZIMUTH-8 bit BAM Part 1 ELEVATION-8 bit BAM
		Part 2 AZIMUTH-8 bit BAM Part 2 ELEVATION- 8 bit BAM - - - Part N AZIMUTH-8 bit BAM Part N ELEVATION-8 bit BAM

*NOTE

For even numbers of articulated parts, a 16 bit padding shall be added to maintain 32 bit boundaries.

FIGURE 4-28. Activate Request PDU (cont)

4.3.6.2.2 ACTIVATE RESPONSE PDU. Response to an ACTIVATE REQUEST PDU should be communicated by the issue of an ACTIVATE RESPONSE PDU. The following fields describe the Activate Response PDU:

a. **Entity Identification.** This field should identify the entity receiving the ACTIVATE REQUEST PDU. This should be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Time Limit.** This field should specify an upper limit for the period of time a simulator responding to an ACTIVATE REQUEST PDU has to begin issuing ENTITY APPEARANCE PDUs (see 4.3.4.1). This field should be represented by an 16 bit unsigned integer specifying time in seconds.

c. **Result.** This field should describes the result of the activate request. This field should be represented by ACTIVATE RESULT described below:

ACTIVATE RESULT - This data type should be an 8 bit enumerated field. The following choices shall be used:

0 Other
1 Activate Request Accepted
2 Invalid Activate Parameter
3 Unexpected Activate Parameter

This PDU is represented in Figure 4-29.

FIELD SIZE (bits)	ACTIVATE RESPONSE PDU FIELDS	
48	ENTITY ID	SITE ID-16 bit uns int
		HOST-16 bit uns int
		ENTITY-16 bit uns int
16	TIME LIMIT	16 bit uns int
8	RESULT	ACTIVATE RESULT-8 bit enum
24	PADDING	24 bits unused

Figure 4-29. Activate Response PDU

4.3.6.3 DEACTIVATION.

4.3.6.3.1 DEACTIVATE REQUEST PDU. Deactivation of a simulated entity should be performed by issuing a DEACTIVATE REQUEST PDU. A DEACTIVATE REQUEST PDU should be issued in either of the following situations:

a. A simulator wishes to withdraw its own entity from the simulation exercise and wishes to inform other simulators of its intention.

b. One simulator wishes to request that another cease simulating its entity. A response is required in the form of a DEACTIVATE RESPONSE PDU.

In the first situation, those receiving the DEACTIVATE REQUEST PDU cease to dead reckon, and display the withdrawn entity. No response to this PDU is required.

In the second situation, upon receiving a request to issue a DEACTIVATE REQUEST PDU, that simulator should respond with a DEACTIVATE RESPONSE PDU, and should cease simulating its entity. Other simulators receiving the same DEACTIVATE REQUEST PDU simply cease to dead reckon and display the deactivated entity.

The DEACTIVATE REQUEST PDU should be described by the following fields:

a. **Entity Identification.** This field should identify the entity to be deactivated. It should be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Reason.** This field should provide the reason for deactivation of the entity. It should be represented by DEACTIVATE REASON described below:

DEACTIVATE REASON. This data type should be represented by an 8 bit enumeration. One of 5 reasons should be given for deactivating an entity. These are:

0 Other
1 Exercise End
2 Entity Withdrawn
3 Entity Destroyed
4 Towing Departure

This PDU is represented in Figure 4-30.

FIELD SIZE (bits)	DEACTIVATE REQUEST PDU FIELDS	
48	ENTITY ID	SITE ID-16 bit uns int
		HOST-16 bit uns int
		ENTITY-16 bituns int
8	REASON	DEACTIVATE REASON-8 bit enum
8	PADDING	8 bits unused

FIGURE 4-30. Deactivate Request PDU

4.3.6.3.2 DEACTIVATE RESPONSE PDU. Response to a DEACTIVATE REQUEST PDU should be communicated by issuing a DEACTIVATE RESPONSE PDU. The following fields should describe the Deactivate Response PDU:

a. **Entity Identification.** This field should identify the entity to be deactivated. It should be represented by an ENTITY IDENTIFIER record (see 4.2.8).

b. **Result.** This field should indicate whether the deactivation request has been accepted, and, if not, why. This field should be represented by DEACTIVATE RESULT and is described below:

DEACTIVATE RESULT - This field should be an 8 bit enumeration. Presently four deactivate results are defined:

0 Other
1 Deactivate Request Accepted
2 Invalid Deactivate Parameter
3 Unexpected Deactivate Reason
4 Vehicle Not Active

This PDU is represented in Figure 4-31.

FIELD SIZE (bits)	DEACTIVATE RESPONSE PDU FIELDS	
48	ENTITY ID	SITE ID-16 bit uns int
		HOST-16 bit uns int
		ENTITY-16 bit uns int
8	RESULT	DEACTIVATE RESULT-8 bit enum
8	PADDING	8 bits unused

FIGURE 4-31. Deactivate Response PDU

5. DETAILED REQUIREMENTS
(not applicable)

6. NOTES

This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.

6.1 Intended use. Protocol conforming to the requirements of this standard is intended for use in a Distributed Interactive Simulation. The purpose of this standard is to standardize the datagrams communicated between simulated entities to ensure interoperability of dissimilar simulators.

6.2 Description of Distributed Interactive Simulation.

6.2.1 Introduction. The term Distributed Interactive Simulation refers to an architectural approach in which the simulation is distributed across a number of independent and self-sufficient computers instead of one central computer. The term interactive refers to the fact that these computers constantly interact by sending messages about the current state of the simulation entities under their control, thereby allowing the other computers to incorporate these state changes into their simulations.

6.2.2 Definition. Distributed Interactive Simulation can be defined in the following manner:

> Distributed Interactive Simulation (DIS) is an exercise involving the interconnection of a number of simulation devices in which the simulated entities are able to interact within a computer generated environment. The simulation devices may be present in one location, interconnected by a Local Area Network (LAN), or may be widely distributed on a Wide Area Network (WAN).

6.2.3 DIS Application. One application of DIS is the simulation of battle scenarios involving various vehicles simulators such as M1 tanks, F-16 fighter jets, or Navy ships. It is to this application that this standard is addressed.

6.2.4 Requirements for DIS. DIS has certain functional requirements. These requirements are to provide:

- Entity Information
- Entity Interaction
- DIS Management
- Environment Information

These requirements are described in detail in the Rationale

Document that accompanies this standard. A brief description of each requirement is given in the paragraphs that follow.

6.2.4.1 Entity Information. Because of the great variety of simulated entities that can be involved in a single exercise, it is important to be able to transmit detailed information concerning each entity. This includes information pertaining to the identity of the entity, its orientation, and how an entity might appear to others.

6.2.4.1.1 Types. The simulated entity could be a vehicle, a building, or a projectile such as a missile or a cloud of smoke. A method for identifying entities that would allow for a variety of different objects is needed.

6.2.4.1.2 Location and Orientation. The issue of location, orientation, velocity, and acceleration (when appropriate) of an entity is important for representation of the simulated entity by a computer. In order to keep network traffic within acceptable limits, the location and orientation information should contain velocity and sometimes acceleration. This information allows the receiving computer to model (dead reckon) the position of the entity over time without requiring constant updates over the network.

6.2.4.1.3 Appearances. The appearance of a simulated entity can be expressed in a number of ways. For example, in addition to visual appearance, it also has a certain infrared signature. If the exercise is taking place in the ocean, the sound an entity makes can identify it. Consequently, each entity has two "appearances": one is from the reflection of visible light and the other is from the emission of sound or electromagnetic energy such as heat, radar, radio, etc.

6.2.4.2 Entity Interaction. Throughout a simulation exercise, entities interact with each other. This interaction may be represented by weapons fire, update rate control, logistics support, collisions, or electronic interactions (such as radar, sonar, etc.).

6.2.4.2.1 Weapons Fire - When a simulated entity fires its weapon, its simulator needs to communicate the location of the firing weapon and the type of munition fired. Depending on the munition type, a determination of the impact location is made. Given the munition type and the location of impact, all simulators assess their own entity damage.

6.2.4.2.2 Update Rate Control - The frequency at which one simulated platform must transmit an update of its location and orientation to another platform depends on what task the operator

of the simulator is attempting to execute. If the operator of one platform is simply observing the other platform's motion for identification, the exact location of the platform is less critical and frequent updates are not required. However, if the operator is tracking the other platform in preparation for firing or is maneuvering in formation, the exact location is critical and a higher update rate is required. DIS requires a means of controlling platform location and orientation update rate in order to meet the requirements for some critical operator tasks without overloading the network while the operator is executing less critical tasks.

6.2.4.2.3 Logistic Support - Other services may be represented in a simulated exercise such as resupply or repair of vehicles. This function and similar ones are provided by logistics support.

6.2.4.2.4 Collisions - It is necessary to represent the collision of entities in a simulation. When a collision occurs, both entities must be aware of the collision. Each determines any resulting damage.

6.2.4.2.5 Electronic Interaction - The development of technology in the area of sensory data has produced a variety of sensors and emitters ranging from the sonar of ships to the tracking radar of aircraft. Representation of these devices is essential in a simulation exercise.

6.2.4.3 DIS Management. Centralized control of a Distributed Interactive Simulation is necessary to manage the operation of the network hardware, certain aspects of the simulation exercise, and to allow for the gathering of performance measures. DIS management functions can be divided into three categories: Network Management, Simulation Management and Performance Measures.

6.2.4.3.1 Network Management - Network management functions handle the basic network functions such as load management, monitoring of nodes and gateways, and error recovery. The network manager would also have knowledge of entities on the network, such as entity location and network address. Analysis of network performance is also performed here.

6.2.4.3.2 Simulation Management - There is also a need for centralized control of the simulation exercise. Functions of simulation management include: Start, Restart, Maintenance, and Shutdown of the exercise. Other functions required include introduction of late players and the collection and distribution of certain types of data.

6.2.4.3.3 Performance Measures - The purpose of distributed simulations is to either train individuals to work as a team or to evaluate the performance of developmental hardware in a realistic operational scenario. In either case, some performance measures will be required beyond those that can be observed from responses transmitted over the communications lines. A Performance Measures Subgroup has been formed to address these topics.

6.2.4.4 Environment Information. For simulated entities to participate in the same exercise, they must have access to the same environment information. Different types of information about the environment are necessary to make the exercise as realistic as possible. This information may include changes in the terrain, weather, and degrees of daylight or darkness.

6.2.4.4.1 Changes in the Terrain. Changes in the terrain can be caused by a number of factors. These include engineering effects, such as the construction of a bridge or a building; weapons effects, which could destroy objects such as those created via engineering effects, as well as change the shape of the terrain through the impact of shells or explosion of mines; or natural Effects caused by nature, such as flooding.

6.2.4.4.2 Weather Conditions. Weather conditions have an effect in real life battle scenarios. Similarly, they should have an effect in the battle to be simulated. Conditions such as rain, snow, fog or clouds should have some kind of representation in a simulated exercise. The wind and its effect on a cloud of smoke that effects vehicle visibility or chemicals that effect dismounted infantry should be considered as well.

6.2.4.4.3 Degrees of Daylight/Night. Night battles as well as day battles should be simulated.

6.2.4.4.4 Other Environmental Effects. Other environmental effects could also be considered. The effect of a nuclear blast located some distance away from a simulated entity might be represented. The effects of water temperature and salinity on the propagation of sound must be considered.

6.3 Distributed Interactive Simulation Protocol Data Units Expressed in Ada Code. During subgroup meetings, it was decided that the most effective means of specifying data types was to express them in Ada code. The following is an Ada code representation of the Basic Data types and records and the Protocol Data Units discussed in Section 4. The code is presented for clarification only and is not a requirement for use in the standard.

6.3.1 Basic Data Types and Records.

6.3.1.1 Angles.

```
subtype bam is unsigned_32;
```

6.3.1.2 Angular Velocity Vector Record.

```
type angular_velocity_vector is record
   roll_rate  : integer_32;
   pitch_rate : integer_32;
   yaw_rate   : integer_32;
end record;
```

6.3.1.3 Articulated Part Record.

```
type parts_position is record
   azimuth   : unsigned_8;
   elevation : unsigned_8;
end record

type articulated_parts is array (positive range <>)
                                 of parts_position;
```

6.3.1.4 Boolean.

A boolean data type is a single bit representing a true-false value. It is an enumeration type of one bit, where the value 0 is interpreted as FALSE and 1 as TRUE.

6.3.1.5 Burst Descriptor Record.

```
type burst_descriptor is record
   munition   : entity_type;
   detonator  : entity_type;
   quantity   : unsigned_16;
   rate       : unsigned_16;
end record;
```

6.3.1.6 Emitter Type Record.

```
type emitter_list is (other_emitter,
                      sound_emitter,
                      infrasonic_emitter,
                      vlf_emitter,
                      lf_emitter,
                      hf_emitter,
                      uhf_emitter,
                      shf_emitter,
                      ehf_emitter,
                      infrared_emitter,
                      light_emitter,
                      uv_emitter,
                      xray_emitter,
                      gamma_emitter,
                      cosmic_emitter);

type emitter_table_info is record
   emitter_class    : emitter_list;
   database_number  : integer_8;
   entry_pointer    : unsigned_16;
end record;

type emitter_type is record
   emitter_quantity : unsigned_8;
   emitters         : array(integer range 1..emitter_quantity)
                      of emitter_table_info;
end record;
```

6.3.1.7 Entity Capabilities Record.

```
type entity_capabilities is record
   ammunition_supply : boolean;
   fuel_supply       : boolean;
   recovery          : boolean;
   repair            : boolean;
   reserved          : binary_string(1..28);
end record;
```

6.3.1.8 Entity Identifier Record.

```
type entity_id_type is record
   simulator : simulation_address;
   entity    : unsigned_16;
end record;
```

6.3.1.9 Entity Marking.

```
max_entity_marking_length : constant := 12;
```

```
type character_set_type is (ascii_character_set);

type text_type is array(integer range
                        1..max_entity_marking_length)
                        of character;

type entity_marking is record
   character_set : character_set_type;
   text          : text_type;
end record;
```

6.3.1.10 Entity Type.

```
subtype entity_type is unsigned_32;
```

6.3.1.11 Euler Angles: Representation of Entity Orientation.

```
type euler_angles is record
   yaw   : bam;
   pitch : bam;
   roll  : bam;
end record;
```

6.3.1.12 Event Identifier.

```
subtype event_id_type is unsigned_16;
```

6.3.1.13 Exercise Identifier.

```
subtype exercise_id is unsigned_8;
```

6.3.1.14 Linear Acceleration Vector Record.

```
type acceleration_vector is record
   x : integer_32;
   y : integer_32;
   z : integer_32;
end record;
```

6.3.1.15 Linear Velocity Vector Record.

```
type velocity_vector is record
   x : integer_32;
   y : integer_32;
   z : integer_32;
end record;
```

6.3.1.16 Organizational Unit Record.

```
   type force_type_list is (other,
```

```
                              blue_forces,
                              red_forces,
                              white_forces);

type country_id_list is (other,
                              usa,
                              ussr,
                              france,
                              west_germany,
                              united_kingdom,
                              japan,
                              china,
                              iran,
                              italy,
                              poland,
                              east_germany,
                              iraq,
                              saudi_arabia,
                              czechoslovakia,
                              india,
                              canada,
                              romania,
                              spain,
                              bulgaria,
                              netherlands);

type service_type_list is (service_other,
                                service_resupply,
                                service_repair,
                                service_tow,
                                service_rescue);

type unit_type_list is (unit_type_irrelevant,
                             unit_type_1,
                             unit_type_2,
                             unit_type_3,
                             unit_type_4,
                             unit_type_5,
                             unit_type_6,
                             unit_type_7,
                             unit_type_8);

type organizational_unit is record
   force_type          : force_type_list;
   country             : country_id_list;
   service             : service_type_list;
   unused              : binary_string(1..8);
   hierarchy           : unit_type_list;
end record;
```

6.3.1.17 Repair Type.

```
subtype repair_type is unsigned_16;

repair_everything : constant := 0;
```

6.3.1.18 Service Type.

```
type service_type_list is (service_other,
                           service_resupply,
                           service_repair,
                           service_tow,
                           service_rescue);
```

6.3.1.19 Simulation Address Record.

```
subtype site_id is unsigned_16;

type simulation_address is record
   site : site_id;
   host : unsigned_16;
end record;
```

6.3.1.20 Supply Quantity Record.

```
type supply_quantity is record
   supply   : entity_type;
   quantity : unsigned_32;
end record;
```

6.3.1.21 Terrain Database Identifier.

```
max_terrain_name_length : constant := 12;

type terrain_name_type is array(integer range
                                1..max_terrain_name_length)
                                of character;

type terrain_database_id is record
   terrain_name    : terrain_name_type;
end record;
```

6.3.1.22 Time Stamp: Representation of Time.

```
subtype time_stamp is unsigned_32;
```

6.3.1.23 World Coordinates Record.

```
type world_coordinates is record
   x : integer_32;
```

```
   y : integer_32;
   z : integer_32;
end record;
```

6.3.2 Distributed Interactive Simulation Protocol Data Units.

6.3.2.1 Entity Appearance PDU.

```
type entity_appearance_pdu is record
   entity_id           : entity_id_type;
   marking             : entity_marking;
   capabilities        : entity_capabilities;
   time                : time_stamp;
   dynamic_appearance  : unsigned_32;
   location            : world_coordinates;
   velocity            : velocity_vector;
   acceleration        : acceleration_vector;
   orientation         : euler_angles;
   angular_rates       : angular_velocity_vector;
   parts               : parts_position;
end record;
```

6.3.2.2 Fire PDU.

```
type fire_pdu is record
   event_id          : event_id_type;
   firing_entity     : entity_id_type;
   target            : entity_id_type;
   burst             : burst_descriptor;
   location          : world_coordinates;
   velocity          : velocity_vector;
   munition_id       : entity_id_type;
   munition_range    : unsigned_32;
end record;
```

6.3.2.3 Detonation PDU.

```
type detonation_pdu is record
   event_id          : event_id_type;
   attacker_id       : entity_id_type;
   burst             : burst_descriptor;
   munition_id       : entity_id_type;
   velocity          : velocity_vector;
   location          : world_coordinates;
end record;
```

6.3.2.4 Update Request PDU.

```
type pdu_list is (other_pdu,
                  appearance_pdu,
                  emitter_pdu);

type update_request_pdu is record
   requestor_id      : entity_id_type;
   responder_id      : entity_id_type;
   duration          : unsigned_32;
   pdu_kind          : pdu_list;
   linear_threshold  : world_coordinates;
   angular_threshold : euler_angles;
end record;
```

6.3.2.5 Update Response PDU.

```
type update_result is (other,
                       change_accepted,
                       change_inappropriate,
                       change_not_implemented);

type update_response_pdu is record
   responder_id         : entity_id_type;
   update_change_result : update_result;
end record;
```

6.3.2.6 Service Request PDU.

```
type service_type_list is (service_other,
                           service_resupply,
                           service_repair,
                           service_tow,
                           service_rescue);

type service_request_pdu is record
   requestor_id : entity_id_type;
   supplier_id  : entity_id_type;
   service_type : service_type_list;
end record;
```

6.3.2.7 Service Cancel PDU.

```
type service_cancel_pdu is record
   requestor_id : entity_id_type;
   supplier_id  : entity_id_type;
end record;
```

6.3.2.8 Service Complete PDU.

```
type service_result_list is (service_complete,
                             invalid_service);
```

```
type service_complete_pdu is record
   requestor_id   : entity_id_type;
   supplier_id    : entity_id_type;
   service_type   : service_type_list;
   service_result : service_result_list;
end record;
```

6.3.2.9 Resupply Offer PDU.

```
type supply_quantity is record
   munition : entity_type;
   quantity : unsigned_32;
end record;

type resupply_offer_pdu is record
   receiver_id        : entity_id_type;
   supplier_id        : entity_id_type;
   number_supplies    : unsigned_8;
   available_supplies : array(integer range 1..number_supplies
                              of supply_quantity);
end record;
```

6.3.2.10 Repair Offer PDU.

```
subtype repair_type_list is unsigned_16;

type repair_offer_pdu is record
   offeror_id    : entity_id_type;
   receiver_id   : entity_id_type;
   repair_type   : repair_type_list;
end record;
```

6.3.2.11 Collision PDU.

```
type collision_pdu is record
   entity_id  : entity_id_type;
   target_id  : entity_id_type;
end record;
```

6.3.2.12 Emitter PDU.

```
subtype emitter_mode is unsigned_8;

type emitter_list is (other_emitter,
                      sound_emitter,
                      infrasonic_emitter,
                      vlf_emitter,
                      lf_emitter,
                      hf_emitter,
                      uhf_emitter,
```

```
                        shf_emitter,
                        ehf_emitter,
                        infrared_emitter,
                        light_emitter,
                        uv_emitter,
                        xray_emitter,
                        gamma_emitter,
                        cosmic_emitter);


type emitter_pdu is record
   emitter_id          : entity_id_type;
   time                : time_stamp;
   location            : world_coordinates;
   emitter             : emitter_type;
end record;
```

6.3.2.13 Activate Request PDU.

```
type activate_reason is (activate_reason_other,
                         exercise_start,
                         exercise_restart,
                         vehicle_reconstitution,
                         towing_arrival);

type stores is array (integer range 1..number_supplies) of
                        supply_quantity;

type activate_request_pdu is record
   reason              : activate_reason;
   time                : time_stamp;
   terrain             : terrain_database_id;
   entity_id           : entity_id_type;
   type_spec           : entity_type;
   unit                : organizational_unit;
   marking             : entity_marking;
   capabilities        : entity_capabilities;
   emitters            : emitter_type;
   inventory           : stores;
   location            : world_coordinates;
   orientation         : euler_angles;
   parts               : articulated_parts;
end record;
```

6.3.2.14 Activate Response PDU.

```
type activate_result is (activate_result_other,
                         activate_request_accepted,
                         invalid_activate_parameter);
```

```
type activate_response_pdu is record
   entity_id   : entity_id_type;
   result      : activate_result;
   time_limit  : unsigned_16;
end record;
```

6.3.2.15 Deactivate Request PDU.

```
type deactivate_reason is (deactivate_reason_other,
                           exercise_end,
                           entity_withdrawn,
                           entity_destroyed,
                           towing_departure);

type deactivate_request_pdu is record
   entity_id   : entity_id_type;
   reason      : deactivate_reason;
end record;
```

6.3.2.16 Deactivate Response PDU.

```
type deactivate_result is (deactivate_result_other,
                           deactivate_request_accepted,
                           invalid_deactivate_parameter,
                           unexpected_deactivate_reason,
                           vehicle_not_active);

type deactivate_response_pdu is record
   entity_id   : entity_id_type;
   result      : deactivate_result;
end record;
```

APPENDIX A

The Open Systems Interconnection Reference Model

10. SCOPE.

10.1 Scope. This Appendix gives an overview of the ISO Open Systems Interconnection Reference Model. This Appendix is not a mandatory part of the standard. The information contained herein is intended for guidance only.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. DETAILS.

The design of a computer network consists of different "layers" or "levels". Each layer is built upon its predecessor and is responsible to provide services to the higher layers in a manner transparent to the higher layers. Different networks may have a different number of layers or different functions within the layers. In 1984, the Open Systems Interconnection Reference Model (OSI) was developed by the International Organization for Standardization (ISO) as a model of a computer communications architecture (see Fig. A-1) The model is 'Open' because it refers to systems that are open for communication with other systems.

It is important to understand that OSI is not an architecture in and of itself. The intent of the OSI model is that protocols be developed to perform the functions of each layer. The functions provided by each layer, as presented in Tannenbaum [3], are summarized in Table II .

APPENDIX A

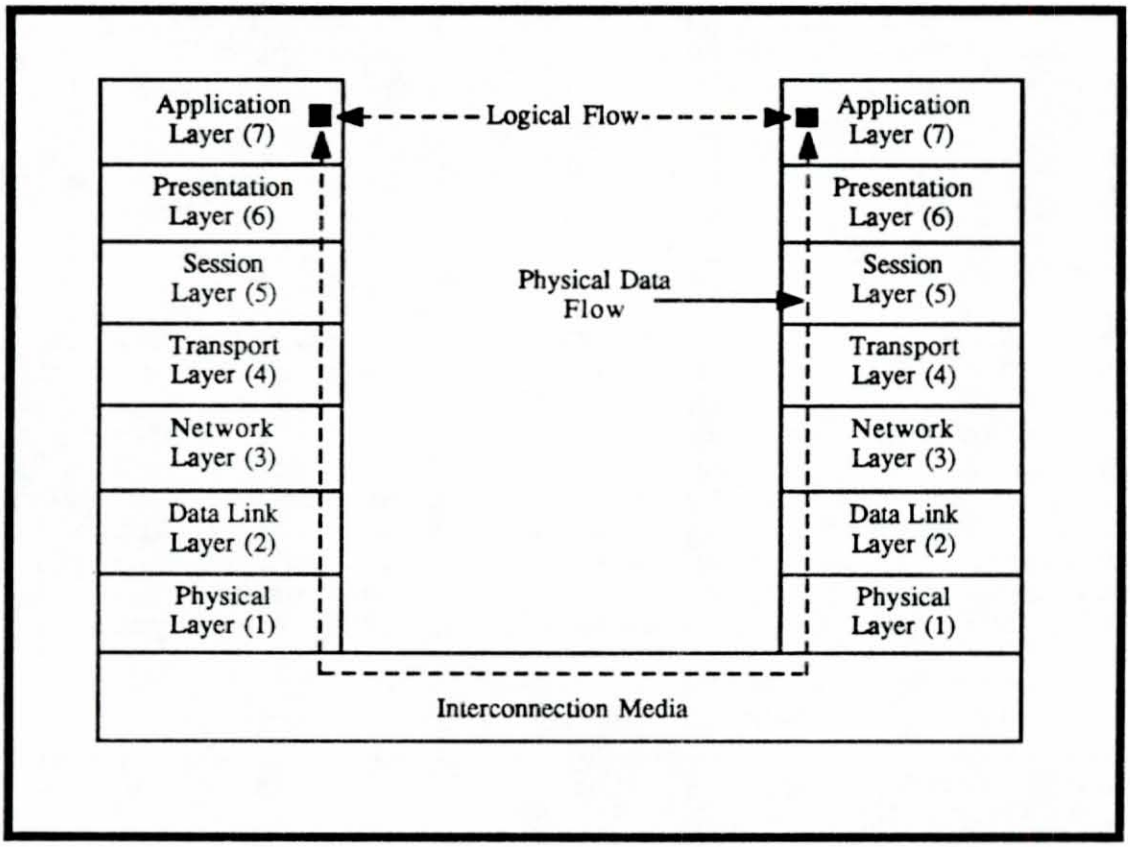

FIGURE A-1. Open Systems Interconnection Reference Model

APPENDIX A

TABLE II. Functions of OSI Layers

LAYER	FUNCTION
1-Physical	Concerns the transmission of unstructured bit stream over physical medium; deals with the mechanical, electrical, functional, and procedural characteristics to access the physical medium.
2-Data Link	Provides for the reliable transfer of information across the physical link; sends blocks of data (frames) with the necessary synchronization, error control, and flow control.
3-Network	Provides upper layers with independence from the data transmission and switching technologies used to connect systems; responsible for establishing, maintaining, and terminating connections.
4-Transportation	Provides reliable, transparent transfer of data endpoints; provides end-to-end error recovery and flow control.
5-Session	Provides the control structure for communication between applications; establishes, manages, and terminates connections (sessions) between cooperating applications.
6-Presentation	Provides independence to the application processes from differences in data representation (syntax).
7-Application	Provides access to the OSI environment for users and also provides distributed information services.

APPENDIX B1

Bit Definitions for the Entity Type field

10. SCOPE.

10.1 Scope. This Appendix specifies the interpretation of the 32 bit unsigned integer that represents the Entity Type. This Appendix is a mandatory part of the standard. The information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. DETAILS.

30.1 Classification. The first 3 bits specify the entity's classification. The definition of the remaining 29 bits is based on this classification.

Classification: Bits 0-2

Field Value	Classification
0	Other
1	Platform
2	Munition
3	Life form
4	Environmental
5	Cultural Feature

The following is a detailed discussion concerning the remaining 29 bits for each of the classifications described above.

30.1.1 Platform Class.

30.1.1.1 Domain. Bits 3-5 define a platform's Domain. The defined values for this field are as follows:

Domain: Bits 3-5

Field Value	Domain
0	Other
1	Land
2	Air
3	Surface
4	Subsurface

5	Space

30.1.1.2 Country. Bits 6-10 represent the country to which a particular platform is attributed. The defined values for these bits are as follows:

Country: Bits 6-10

Field Value	Country
0	Other
1	U.S.
2	U.S.S.R
3	France
4	West Germany
5	United Kingdom
6	Japan
7	China
8	Iran
9	Italy
10	Poland
11	East Germany
12	Iraq
13	Saudi Arabia
14	Czechoslovakia
15	India
16	Canada
17	Romania
18	Spain
19	Bulgaria
20	Netherlands

30.1.1.3 Specific Platform Definition. The remaining twenty bits will uniquely define all platforms according to the above categories. The defined values for these bits and the platforms associated with them is included in Appendix E2.

30.1.2 Munition Class.

For an entity whose class is munition, the next four bits (3-6) following the classification define the munitions type. There are six values currently defined:

Type: Bits 3-6

Field Value	Type
0	Miscellaneous

1	Detonator
2	Ballistic
3	Guided Munitions
4	Petroleum, Oil, and Lubricants
5	Propellant

For munitions that are Guided, a separate bit scheme is defined in 30.1.2.2. (Note that fuel is defined in the munitions classification. This is for the resupply functions of Distributed Interactive Simulation). For other types of munitions, the remaining 25 bits are defined below:

30.1.2.1 Detonator, Ballistic, and Propellant Munition Types. Bits 7-31 are defined in the following manner:

30.1.2.1.1 Caliber. Bits 7-11 indicate the caliber of the munition. The values defined for these bits are as follows:

Caliber: Bits 7-11

Field Value	Caliber
0	caliber not applicable
1	caliber > 0 mm, but <= 10 mm
2	caliber > 10 mm, but <= 20 mm
3	caliber > 20 mm, bit <= 30 mm
.	.
.	.
.	.
31	caliber > 300 mm

30.1.2.1.2 Subtype. Bits 12-15 specify a subtype of munition which depends on the munition type. These subtypes are specified below:

Subtype: Bits 12-15

Type		Field Value	Subtype
1	Detonator	0	Other
		1	Percussion
		2	Proximity
		3	Time
2	Ballistic	0	Other
		1	Biological

		2	Bomblets
		3	Chemical
		4	High Explosive
		5	High Explosive, Plastic
		6	High Explosive, Incendiary
		7	Illumination
		8	Kinetic
		9	Nuclear
		10	Practice
		11	Shaped Charge
		12	Smoke
5	Propellant	0	Other
		1	Bagged
		2	Canistered

30.1.2.1.3 Country. Bits 16-21 indicate the country to which the munition's design is attributed. The values defined for this field are identical to the Country values for the Platform classification of entities in 30.1.1.2.

30.1.2.1.4 Series. Bits 22-26 identify the particular series to which the munition belongs. This field is dependent upon the particular type of munition being represented.

30.1.2.1.5 Model. Bits 27-31 identify the particular model to which the munition belongs. This field is dependent upon the particular type of munition being represented.

30.1.2.2 Guided Munition Types.

For Guided Munitions types, bits 7-31 are defined in the following manner:

30.1.2.2.1 Target. Bits 7-11 describe the intended target of the munitions. The values presently defined for this field are as follows:

Target: Bits 7-11

Field Value	Target
0	Miscellaneous
1	Anti-Aircraft
2	Anti-Armor
3	Anti-Missile
4	Anti-Radar
5	Anti-Satellite

6	Anti-Ship
7	Anti-Submarine
8	Anti-Personnel
9	Strategic

30.1.2.2.2 Warhead. Bits 12-15 indicate the type of warhead the munition is carrying. The values presently defined for this field are as follows:

Warhead: Bits 12-15

Field Value	Warhead
0	Miscellaneous
1	Biological
2	Bomblets
3	Chemical
4	High Explosive
5	High Explosive, Plastic
6	High Explosive, Incendiary
7	Illumination
8	Kinetic
9	Nuclear
10	Practice
11	Shaped Charge
12	Smoke

30.1.2.2.3 Country. Bits 16-21 indicate the country to which the munition's design is attributed. The values defined for this field are identical to the Country values for the Platform classification of entities in 30.1.1.2.

30.1.2.2.4 Series. Bits 22-26 identify the particular series to which the munition belongs. This field is dependent upon the particular type of munition being represented.

30.1.2.2.5 Model. Bits 27-31 identify the particular model to which the munition belongs. This field is dependent upon the particular type of munition being represented.

30.1.3 Life Forms Class. The Life Form entity classification refers to Dismounted Infantry, Scouts, SEALS or other pedestrian soldiers. They will be treated in a manner similar to platforms because they can move and can launch munitions.

30.1.3.1 Domain. Bits 3-5 define the life form's Domain. The defined values for this field are specified in 30.1.1.1.

30.1.3.2 Country. Bits 6-10 represent the country to which a particular life form is attributed. The defined values for this field are specified in 30.1.1.2.

30.1.3.3 Specific Life Form Definition. The remaining twenty bits will uniquely define all life forms according to the above categories. The defined values for these bits and the platforms associated with them is included in Appendix E2.

30.1.4 Environmental Class. Environmental entities include clouds, smoke and biologics. The 29 bits are defined in the following manner:

30.1.4.1 Domain. Bits 3-5 define the environmental's Domain. The defined values for this field are specified in 30.1.1.1.

30.1.4.2 Type. Bits 6-10 define the environmental type. This type is based on the Domain defined by the previous field of bits. Defined values for this field are as follows:

Type: Bits 6-10

Domain		Field Value	Type
1	Land	0	Other
		1	Smoke
		2	Fog
		3	Dust Cloud
2	Air	0	Other
		1	Smoke
		2	Fog
		3	Flock of Birds
		4	Cloud
		5	Cloud With Rain Falling
		6	Cloud With Snow Falling
3	Surface	0	Other
4	Subsurface	0	Other
		1	Thermocline
		2	Knot
		3	School of Fish
		4	Whale
		5	School of Shrimp

5	Space	0	Other

30.1.4.3 Unused bits. The remaining 21 bits are currently unused but may be defined later to further describe environmentals.

30.1.5 Cultural Features Class. Cultural features represented as entities incorporate engineering, weapons, and natural effects. These include craters, earth mounds, and vehicle tracks.

The 29 bits are defined in the following manner:

30.1.5.1 Domain. Bits 3-5 define the cultural feature's Domain. The defined values for this field are specified in 30.1.1.1.

30.1.5.2 Type. Bits 6-10 define the type of cultural feature. This type is based on the Domain defined by the previous field of bits. Defined values for this field are as follows:

Domain		Field Value	Type
1	Land	0	Other
		1	Bridge
		2	Building
		3	Tracks
		4	Defensive Embankment
		5	Crater
		6	Ditch
2	Air	0	Other
3	Surface	0	Other
4	Subsurface	0	Other
5	Space	0	Other

30.1.5.3 Specific. The remaining 21 bits are used to specify specific types of cultural features based on the Type field. Some of these have been defined and are included below:

Specific: Bits 11-31

Type		Field Value	Specific
1	Bridge	0	Other

APPENDIX B1

		1	Bridge-Concrete-Two Lane
		2	Bridge-Concrete-Four Lane
		3	Bridge-Truss-Two Lane
		4	Bridge-Truss-Four Lane
		5	Bridge-Suspension-Two Lane
		6	Bridge-Suspension-Four Lane
2	Building	0	Other
		1	Building-One Story
		2	Building-Two Story
		3	Building-Three Story
		4	Building-Four Story
3	Tracks	0	Other
		1	Tank
		2	18-wheel
		3	Four-wheel

APPENDIX B2

Defined Entity Types for the Standard

10. SCOPE.

10.1 Scope. This Appendix defines specific Entity Types corresponding to the Specific field in the 32 bit unsigned integer representing Entity Type (see Appendix E1 for more information on bit definitions for entity type). This Appendix is a mandatory part of the standard. The information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. DETAILS.

30.1 Platforms. The following specifies platform entity types that have been defined for this standard.

30.1.1 U.S. Platforms. All entity type codes for U.S. platforms have a classification field value of 1 and a country field value of 1 (see Appendix B1). The following list specifies the specific platform definition values assigned to existing U.S. platforms in each domain.

Domain		Platform Definition Value	
0	Other	0	Other
1	Land	0	Other
		1	M1 Abrams
		2	M1A1 Abrams
		3	IFV
		4	CFV
		5	M2 Bradley
		6	M3 Bradley
		7	M113A2
		8	M577
		9	M106A1
		10	M109 155mm
		11	M88A1
		12	M35A2 2.5 ton
		13	HEMITT M977
		14	HEMITT M978

	15	M48 Medium Tank
	16	M60 Main Battle Tank
	17	M551 Sheridan Light Tank
	18	LAV-25
	19	M110 Self-propelled Howitzer
	20	LVTP-7 Amphibious Assault Vehicle
	21	M901 40mm Machine Gun
	22	155mm M114 Howitzer
	23	155 mm M198 Towed Howitzer
	24	105mm M101A1 Howitzer
	25	105mm M192 Light Howitzer
	26	M578 Light Armored Recovery Vehicle
	27	Mk 19 40mm Machine Gun
	28	81mm M29 Mortar
	29	60mm M224 Lightweight Company Mortar
	30	20mm Vulcan Air Defense System
	31	HUMMV
2 Air	0	Other
	1	A-10
	2	F-14A Tomcat
	3	F-14D
	4	AH-64
	5	OH-58
	6	AH-1
	7	UH-1
	8	CH-47
	9	B-52
	10	C-135
	11	KC-135
	12	E-3A
	13	E-4B
	14	CH-47
	15	H-46
	16	AV-8
	17	AV-8B
	18	A-37
	19	F-16
	20	F-111
	21	FB-111
	22	EF-111
	23	A-4
	24	A-6
	25	EA-6
	26	KA-6
	27	E-2
	28	OV-10
	29	SH-2

		30	C-5
		31	C-130
		32	C-141
		33	P-3
		34	S-3
		35	F-4
		36	F-8 Crusader
		37	F-15
		38	FA-18
		39	KC-10
		40	F-5
		41	OV-10
		42	B-1
		43	B-2
		44	SH-3
		45	CH-53
		46	UH-60
		47	A-7
		48	F-100
		49	F-104
		50	F-101
		51	F-102
		52	F-106
		53	F-105
3	Surface	0	Other
		1	Wasp Class
		2	Spruance Class
		3	Ticonderoga Class
		4	Nimitz Class
		5	Iowa Class
		6	Pegasus Class
		7	Belknap Class
		8	Leahy Class
		9	Virginia Class
		10	California Class
		11	Truxtun Class
		12	Bainbridge Class
		13	Long Beach Class
		14	Kitty Hawk Class
		15	Oliver Perry Class
		16	Glover Class
		17	Blue Ridge Class
		18	Forrestal Class
		19	Midway Class
		20	Enterprise Class
		21	Arleigh Burke Class
		22	Kidd Class

		23	Coontz Class
		24	Charles Adams Class
		25	Knox Class
		26	Garcia Class
		27	Yellowstone Class
		28	Mars Class
4	Subsurface	0	Other
		1	Ohio Class
		2	Ben Franklin Class
		3	Sturgeon Class
		4	Skipjack Class
		5	Los Angeles Class
		6	Lafayette Class
		7	Glenard P. Lipscomb Class
		8	Narwhal Class
		9	Ethan Allen Class
		10	Permit Class
		11	Barbel Class
		12	Darter Class
		13	Dolphin Class
5	Space	0	Other

30.1.2 Soviet Platforms. All entity type codes for Soviet platforms have a classification field value of 1 and a country field value of 2. The following list specifies the specific platform definition values assigned to existing Soviet platforms in each domain.

Domain		Platform Definition Value	
0	Other	0	Other
1	Land	0	Other
		1	M-1943
		2	T-72
		3	T-72M
		4	T-80
		5	BRDM-1
		6	BMP-1
		7	BMP-1K
		8	2S1 122mm
		9	BMP-2
		10	ZSU-23-4
		11	ZSU-23-4M
		12	GAZ-66

		13	Ural-375
		14	Cargo
		15	Fuel tanker
		16	T-64 Main Battle Tank
		17	T-62 Main Battle Tank
		18	T-54/55 Main Battle Tank
		19	T-10 Heavy Tank
		20	PT-76 Amphibious Light Tank
		21	BTR-40/BRDM-1 and BRDM-2 Recce Vehicles
		22	BMP-1/-2 Mech Infantry Combat Vehicle
		23	MT-LB Tracked Vehicle
		24	BTR-60/-70 Amphibious Wheeled APC
		25	BTR-50 Amphibious Tracked APC
		26	ACRV-2 Command and Reconnaissance Vehicle
		27	152mm M-1973 Self-Propelled Gun
		28	122mm M-1974 Self-propelled Howitzer
		29	ASU-85 Airborne Assault Gun
		30	BND Air-Portable Fire Support Vehicle
		31	S-23 Field Gun
		32	D-20 Gun-Howitzer
		33	M-46 Field Gun
		34	D-30 Field Howitzer
		35	M-1955 and T-12 Anti-tank and Field Guns
		36	D-44 and SD-44 Anti-tank and Field Guns
		37	Frog-3 Artillery Rocket
		38	Frog-4 Artillery Rocket
		39	Frog-5 Artillery Rocket
		40	Frog-7 Artillery Rocket
		41	SS-1 Scud-A and -B Medium Range Missiles
		42	SS-12 Medium Range Missile
		43	BM-21 Rocket Launcher
		44	BM-24 Rocket Launcher
		45	BM-25 Rocket Launcher
		46	M-1937 Mortar
		47	M-1943 Mortar
		48	M-160 Mortar
		49	M-240 Mortar
2	Air	0	Other
		1	MIG-17
		2	MIG-19
		3	MIG-21 Fishbed
		4	MIG-23
		5	MIG-25 Foxbat
		6	MIG-27 Flogger-D
		7	MIG-29 Fulcrum
		8	MIG-31 Foxhound

	9	Mi-2 Hoplite
	10	Mi-6 Hook
	11	Mi-8 Hip
	12	Mi-24 Hind
	13	Mi-26
	14	Mi-28 Havoc
	15	Hokum
	16	M-4
	17	Ka-25
	18	Ka-27
	19	SU-9 Fishpot
	20	SU-7
	21	SU-11
	22	SU-15 Flagon
	23	SU-17 Fitter
	24	SU-20 Fitter C
	25	SU-22 Fitter J
	26	SU-24 Fencer
	27	SU-27 Flanker
	28	TU-16 Badger
	29	TU-20
	30	TU-22 Blinder
	31	TU-26 Backfire
	32	TU-95 Bear
	33	TU-128 Fiddler
	34	Yak-25
	35	Yak-27R
	36	Yak-28P Firebar
	37	Yak-38 Forger
3 Surface	0	Other
	1	Kiev Class
	2	Moskva Class
	3	Krasina Class
	4	Kirov Class
	5	Kara Class
	6	Kresta II Class
	7	Kresta I Class
	8	Kynda Class
	9	Guided Missile Cruiser Sverdlov Class
	10	Command Cruisers: Converted Sverdlov Class
	11	Light Cruisers: Sverdlov Class
	12	Udaloy Class
	13	Sovremenny Class
	14	Modified Kashin Class
	15	Kashin Class
	16	Kanin Class
	17	Modified Kildin Class

	18	Kildin Class
	19	Sam Kotlin Class
	20	Kotlin Class
	21	Skory Class
	22	Koni Class
	23	Krivak Classes
	24	Grisha Class
	25	Mirka Classes
	26	Petya Class
	27	Petya Class
	28	Riga Class
	29	Tarantul I/II/III Classes
	30	Nanuchka I/III/IV Classes
	31	Pauk Class
	32	Poti Class
	33	Tbilis Class
	34	Slava Class
	35	Babochka Class
	36	Slepen Class
	37	SOI Class
	38	Pchela Class
	39	Muravey Class
	40	Stenka Class
	41	Zhuk Class
	42	Balcom 8 Class
	43	Parchim II Class
	44	Purga Class
	45	T58 Class
	46	Sarancha Class
	47	OSA I & II Class
	48	Matka Class
	49	Shersen Class
	50	Turya Class
4 Subsurface	0	Other
	1	(SSBN) Typhoon Class
	2	(SSBN) Delta III Class
	3	(SSBN) Delta II Class
	4	(SSBN) Delta Class
	5	(SSBN) Delta IV Class
	6	(SSBN) Yankee Class
	7	(SSN) Yankee Notch Class
	8	(SSGN) Yankee Conversion Class
	9	(SSBN) Hotel Class
	10	(SSB) Golf II and V Class
	11	(SSGN) Oscar II/I Class
	12	(SSGN) Papa Class
	13	(SSGN) Charlie II Class

	14	(SSGN) Charlie I Class
	15	(SSN) Echo I Class
	16	(SSGN) Echo II Class
	17	(SSG) Whiskey Long Bin Class
	18	(SSG) Juliett Class
	19	(SSN) Sierra Class
	20	(SSN) Improved Alfa Class
	21	(SSN) Alfa Class
	22	(SSN) Victor III Class
	23	(SSGN) Victor II Class
	24	(SSN) Akula Class
	25	(SSN) Mike Class
	26	(SSN) Victor I Class
	27	(SSN) Echo Class (formerly SSGN)
	28	(SSN/SSGN) Yankee Class
	29	(SSN) November Class
	30	(SS) Kilo Class
	31	(SS) Zulu IV Class
	32	(SS) Tango Class
	33	(SS) Foxtrot Class
5 Space	0	Other

30.1.3 French Platforms. All entity type codes for French platforms have a classification field value of 1 and a country field value of 3. The following list specifies the specific platform definition values assigned to existing French platforms in each domain.

Domain	Platform Definition Value	
0 Other	0	Other
1 Land	0	Other
	1	F-3 155mm (SP Gun)
	2	AMX-30 tank
	3	VAB APC
	4	LOHR FL 400
	5	155mm A UF1 (SP How)
	6	105mm AMX (SP How)
	7	TR 155mm Howitzer (towed)
	8	AU-50 105mm (SP How)
	9	VBC-90 Armored Car
	10	ERC-90 Armored Car
	11	AM1-90 Armored Car
	12	AMX-10 ECH Recov. Veh.
	13	AML-60 Armored Car
	14	Panhard EBR

	15	AMX-10RC Armored Car
	16	AMX-13 Light Tank
	17	AMX-13 IFV
	18	AMX-10 IFV
	19	EBR Armored Car
	20	AMX-13 DCA
	21	AMX-13 VCI APC
	22	Berliet VXB Armored Car
2 Air	0	Other
	1	Super Frelon
	2	Lynx
	3	Super Puma/Puma
	4	Ecureuil
	5	Etendard IV-P
	6	Dauphine II
	7	Alize
	8	Alouette II, III
	9	Super Etendard
	10	Mirage F-1
	11	Mirage IV
	12	Mirage 2000
	13	Jaguar
	14	Gardian
	15	Super Frelon
	16	Gazelle
	17	Magister
	18	Atlantique
	19	Mirage V
	20	Mirage III
	21	Falcon 10-MER
	22	Mirage II
	23	Broussard
	24	SA.342 M
3 Surface	0	Other
	1	Nuclear-Propelled Aircraft Carriers (PAN)
	2	Clemenceau Class
	3	Helicopter carrier
	4	Cruiser
	5	Type F70 Destroyer)
	6	Type F70 (A/A)
	7	Suffren Class
	8	Type F67
	9	Type T56
	10	Type T53
	11	Type 47
	13	Type F65

		14	FL 3000 Class Frigate
		15	Surveillance type
		16	Commandant Riviere Class
		17	"D" Estienne D'Orves Class (Type A69)
4	Subsurface	0	Other
		1	Le Triomphant Class (SNLE-NG)
		2	"L" Inflexible Class (SNLE)
		3	Le Redoutable Class (SNLE)
		4	Rubis Class (SNA 72)
		5	Agosta Class
		6	Daphne Class
		7	Narval Class
5	Space	0	Other

30.1.4 West German Platforms. All entity type codes for West German platforms have a classification field value of 1 and a country field value of 4. The following list specifies the specific platform definition values assigned to existing French platforms in each domain.

Domain		Platform Definition Value	
0	Other	0	Other
1	Land	0	Other
		1	TBD
2	Air	0	Other
		1	TBD
3	Surface	0	Other
		1	TBD
4	Subsurface	0	Other
		1	TBD
5	Space	0	Other

30.1.5 British Platforms. All entity type codes for British platforms have a classification field value of 1 and a country field value of 5. The following list specifies the specific platform definition values assigned to existing French platforms in

each domain.

Domain	Platform Definition Value	
0 Other	0	Other
1 Land	0	Other
	1	Land Rover 6x6 truck
	2	MK-7 MBT
	3	Chieftain MBT
	4	Centurion MBT
	5	Challenger MBT
	6	FV 100 Scorpion Light Tank
	7	FV 601 Saladin
	8	FV 107 Scimitar
	9	FV 105 Sultan
	10	LWB Land Rover
	11	FH-70 155mm gun towed
	12	Abbot 105mm (SP How)
	13	M-109 155mm (SP How)
	14	M-107 175mm (SP How)
	15	FV 432 (APC)
	16	FV 603 Saracen
	17	FV 103 Spartan (APC)
	18	M-110 203mm (SP How)
	19	MCV-80 Combat Veh.
	20	AT-60 armored trans. veh.
	21	AT-105 Saxon (APC)
2 Air	0	Other
	1	Sea harrier FRS.1.
	2	Lynx HAS 2/3
	3	Sea King AEW 2
	4	Sea King HAS 5/6
	5	Tornado ADV
	6	Tornado GR 1
	7	Buccaneer
	8	Phantom
	9	Gazelle
	10	Nimrod MK R1
	11	Puma/Super Puma
	12	Jaguar
	13	Harrier
	14	Lightning
	15	Hawk
	16	Jet Provost
	17	Wessex
	18	Scout

		19	Wasp
		20	Beaver
		21	Chipmunk
		22	Auster
		23	Alouette II
		24	Jet Stream
		25	Bull dog
3	Surface	0	Other
		1	Light aircraft carriers (CVSA)
		2	Type 82
		3	Type 42
		4	Amazon Class
		5	Broadsword Class
		6	Duke Class
		7	Leander Class
		8	Hunt Class
		9	River Class
		10	Ton Class
		11	Sandown Class
4	Subsurface	0	Other
		1	Vanguard Class (SSBN)
		2	Resolution Class (SSBN)
		3	"W" Class
		4	Trafalger Class
		5	Swiftsure Class
		6	Valiant Class
		7	Churchill Class
		8	Upholder Class
		9	Oberon Class
5	Space	0	Other

30.2 Ballistic Munitions. The following specifies ballistic munition entity types that have been defined for this standard.

30.2.1 U.S. Ammunition. All entity type codes for U.S. munitions have a country field value of 1. The following list defines valid series and model field values for particular values of the environment and class fields.

Class;Caliber;Subclass	Series
1 Detonator;155mm;Percussion	M557 (1)
2 Detonator;155mm;Timed	M513 (1)
3 Ballistic;25mm;Kinetic	M791 (1)
4 Ballistic;25mm;HEI	M792 (1)
5 Ballistic;105mm;Kinetic	M392 (1)
6 Ballistic;105mm;Shaped Charge	M456 (1)
7 Ballistic;107mm;High Explosive	M329 (1)
8 Ballistic;155mm;High Explosive	M107 (1)

30.2.2 Soviet Ammunition. All entity type codes for Soviet munitions have a country field value of 2. The following list defines valid series and model field values for particular values of the environment and class fields.

Class;Caliber;Subclass	Series	Model
Ballistic;57mm;High Explosive	S-5 (1)	(0)

30.3 Guided Munitions. The following specifies guided munition entity types that have been defined for this standard.

30.3.1 U.S. Guided Munitions. All entity type codes for U.S. guided munitions have a country field value of 1. The following list defines valid field values for particular guided munitions.

Target:Warhead	Series
1 Miscellaneous	0 Other 1 GBU-15 2 Paveway

		3 Skipper II, AGM-123
2	Anti-Air	0 Other 1 Sidewinder 2 AMRAAM 3 ADSM 4 Falcon 5 Chaparral 6 Hawk, MIM-23B 7 MLMS 8 Phoenix 9 Rapier UK 10 Redeye 11 Roland 12 Sea Sparrow 13 Sparrow 14 RIM 66/67 15 Stinger 16 Patriot, MIM-104 17 Tarter 18 Terrier
3	Anti-armor	0 Other 1 TOW 2 M47 Dragon 3 Hellfire 4 Maverick 5 Copperhead 6 MLRS
4	Anti-Guided Munition	0 Other 1 Decoys TBD
5	Anti-Radar	0 Other 1 Harm, AGM-88A 2 Shrike, AGM-45 3 Standard AGM-78 4 Sidearm AGM-122 5 TACIT RAINBOW
6	Anti-Satellite	0 Other 1 Asat
7	Anti-Ship	0 Other 1 Harpoon, ARM/RGM-84A 2 MK37E Torpedo 3 MK48 Torpedo 4 MK50 Torpedo

		5 Deadeye 5 inch guided projectile
8	Anti-Submarine	0 Other 1 Mk 46 Torpedo 2 Mk 48 Torpedo 3 M50 Torpedo 4 MK37E Torpedo 5 Asrock, RUR-5A 6 CASW/SOW 7 Subroc, UUM-44A
9	Battlefield Support	0 Other 1 ALCM, AGM-86B 2 Bullpup 3 Lance, MGM-52C 4 Pershing, MGM-31 5 Tomahawk AGM-109 6 Tomahawk BGM-109G 7 Walleye, AGM-62 8 SRAM AGM-69
10	Strategic	0 Other 1 Minuteman II, LGM-30 2 Minuteman III 3 Poseidon, UGM-73 4 Titan II, LGM-25C 5 Trident (II) UGM-93A 6 Tomahawk BGM-109A 7 Tomahawk AGM-109 8 Tomahawk BGM-109G 9 ALCM, AGM-86B 10 Peace keeper MGM-118

30.3.2 Soviet Guided Munitions. All entity type codes for Soviet guided munitions have a country field value of 2. The following list defines valid field values for particular guided munitions.

Target:Warhead		Series
0	Miscellaneous	0 Other

APPENDIX B2

1 Anti-Air

0 Other
1 AA-1 Alkali
2 AA-2 Atoll
3 AA-3 Anab
4 AA-4 Awl
5 AA-5 Ash
6 AA-6 Acrid
7 AA-7 Apex
8 AA-8 Aphid
9 AA-9 Amos
10 AA-10 Alamo
11 AA-11 Archer
12 SA-1 Guild
13 SA-2 Guideline
14 SA-3 GOA
15 SA-4 Ganef
16 SA-5 Gammon
17 SA-6 Gainful
18 SA-7 Grail
19 SA-8 Gecko
20 SA-9 Gaskin
21 SA-10 Grumble
22 SA-11 Gadfly
23 SA-12 Gladiator/Giant
24 SA-13 Gopher
25 SA-14 Gremlin
26 SA-15
27 SA-16 man portable sam
28 SA-N-1 GOA
29 SA-N-2 Guideline
30 SA-N-3 Goblet
31 SA-N-4
32 SA-N-5
33 SA-N-6
34 SA-N-7
35 SA-N-9

2 Anti-armor

0 Other
1 RPG-7VAT Rocket Launcher
2 AS-8
3 AT-1 Snapper
4 AT-2 Swatter Missile
5 AT-3 Sagger Missile
6 AT-4 Spigot Missile
7 AT-5 Spandrel Missile
8 AT-6 Spiral Missile
9 AT-7 Saxhorn Missile
10 AT-8 Songster Missile

3	Anti-Guided Munition	0 Other 1 ABM-1B 2 SH-08 3 Decoys TBD
4	Anti-Radar	0 Other 1 AS-4 Kitchen 2 AS-9 3 AS-12 Kegler
5	Anti-Satellite	0 Other
6	Anti-Ship	0 Other 1 AS-2 Kipper 2 AS-4 Kitchen 3 AS-5 Kitchen 4 AS-6 Kingfish 5 AS-13 6 AS-14 Kedge 7 AS-15 8 SS-N-2 Styx 9 SS-N-7 Starbright 10 SS-N-9 Siren 11 SS-N-12 Sandbox 12 SS-N-19 Shipwreck 13 SS-N-22 Sunburn 14 SS-N-3 Shaddock 15 SSC-2B Samlet Cruise Missile 16 SSC-1B Sepal 17 533mm Torpedo 18 406mm Torpedo 19 660mm Torpedo
7	Anti-Submarine	0 Other 1 FRAS-1 2 SSN-14 Silex 3 SSN-15 Starfish 4 SSN-16 Stallion 5 533mm Torpedo 6 406mm Torpedo 7 660mm Torpedo
8	Battlefield Support	0 Other 1 AS-3 Kangaroo 2 AS-4 Kitchen

		3 AS-5 Kelt
		4 AS-7 Kerry
		5 AS-10 Karen
		6 AS-11 Kilter
		7 AS-14 Kedge
		8 AS-15 Kent
		9 AS-X-10
		10 SS-1
		11 SS-12
		12 SS-21
		13 SS-22
		14 SS-23
9	Strategic	0 Other
		1 SS-N-5
		2 SS-N-6
		3 SS-N-8
		4 SS-N-17
		5 SS-N-18
		6 SS-N-20
		7 SS-N-23
		8 SS-N-21
		9 SS-NX-24
		10 SSC-X-4
		11 AS-15
		12 AS-16
		13 SS-4
		14 SS-11
		15 SS-13
		16 SS-16
		17 SS-17
		18 SS-18
		19 SS-19
		20 SS-20
		21 SS-24
		22 SS-25

30.3.3 French Guided Munitions. All entity type codes for French guided munitions have a country field value of 3. The following list defines valid series and model field values for particular values of the target and warhead fields.

Target:Warhead		Series
0	Miscellaneous	0 Other
1	Anti-Air	0 Other
		1 Aster 15

		2 Aster 30
		3 Crotale
		4 Roland
		5 Mistral
		6 Masurca
		7 Mica Missile
		8 R:530 Sidewinder
		9 R-550 Magic
		10 Super 530
2	Anti-Armor	0 Other
		1 SS-11
		2 Eryx Missile
		3 HOT Missile
		4 Milan Missile
		5 ACL-STRIM
		6 Entac
3	Anti-Guided Munition	0 Other
		1 Decoys TBD
4	Anti-Radar	0 Other
		1 Armat
5	Anti-Satellite	0 Other
6	Anti-Ship	0 Other
		1 Exocet
		2 AS-11
		3 AS-12
		4 AS-15
		5 AS-30
		6 AS-37 Martel
		7 ASMP
		8 Otomat
		9 E-14 Torpedo
		10 E-15 Torpedo
		11 F-17 Torpedo
		12 L-5 Torpedo
		13 Z-16 Torpedo
7	Anti-Submarine	0 Other
		1 Malafon
		2 E-14 Torpedo
		3 E-15 Torpedo
		4 F-17 Torpedo
		5 L3 Torpedo
		6 L4 Torpedo

		7 L5 Torpedo
		8 Murene Torpedo
8	Battlefield Support	0 Other
		1 Hades Missile
		2 Pluton Missile
9	Strategic	0 Other
		1 SSBS Type S-30D/TN-61
		2 SSBS Type S-4(SX)
		3 SLBM M-20
		4 SLBM M-4

30.3.4 West German Guided Munitions. All entity type codes for West German guided munitions have a country field value of 4. The following list defines valid guided munitions.

Target:Warhead		Series
0	Miscellaneous	0 Other
1	Anti-Air	0 Other
		1 TBD
2	Anti-Armor	0 Other
		1 TBD
3	Anti-Guided Munition	0 Other
		1 TBD
4	Anti-Radar	0 Other
		1 TBD
5	Anti-Satellite	0 Other
		1 TBD
6	Anti-Ship	0 Other
		1 TBD
7	Anti-Submarine	0 Other
		1 TBD
8	Battlefield Support	0 Other
		1 TBD
9	Strategic	0 Other
		1 TBD

30.3.5 British Guided Munitions. All entity type codes for British guided munitions have a country field value of 5. The following list defines valid guided munitions.

Target:Warhead	Series
0 Miscellaneous	0 Other
1 Anti-Air	0 Other 1 Bloodhound Mk2 2 Rapier 3 Seacat/Tigercat 4 Blowpipe 5 Javelin 6 Star Streak 7 Sea Dart 8 Sea Wolf 9 Sky Flash 10 Fire Streak 11 Red Top
2 Anti-Armor	0 Other 1 Milan missile 2 Swingfire missile 3 Merlin 4 FI TOW 5 Vigilant missile 6 Hot missile
3 Anti-Guided Munition	0 Other 1 Decoys TBD
4 Anti-Radar	0 Other 1 Alarm
5 Anti-Satellite	0 Other
6 Anti-Ship	0 Other 1 Excalibur 2 Sea Eagle 3 Sea Skua 4 Martel 5 Spear fish Torpedo
7 Anti-Submarine	0 Other 1 Tigerfish Torpedo 2 Spear Fish Torpedo 3 Sting Ray Torpedo

Target:Warhead		Series	
		4	Mk 24 Torpedo
8	Battlefield Support	0	Other
		1	Lance
9	Strategic	0	Other

30.4 Life Forms. The following specifies Life Form entity types that have been defined for this standard.

30.4.1 U.S. Life Forms. All entity type codes for U.S. Life Forms have a country field value of 1. The following list defines valid Life Forms.

Domain		Life Form Definition Value	
0	Other	0	Other
1	Land	1	Scout
		Dismounted Infantry With:	
		2	Redeye, FIM-43A
		3	Dragon, M47, FGM-77A
		4	Stinger, FIM-92A
		5	M72 Light Anti-tank Weapon (LAW II)
		6	Mk 193 83mm SMAW
		7	M60 General Purpose Machine Gun
		8	M2 HB Heavy Machine Gun
		9	M67 Recoilless Rifle
		10	M 203 Grenade Launcher
		11	M16A1 Rifle
		12	M9 Pistol
		13	M1911A1 Pistol
		14	M249 SAW
2	Air		None
3	Surface		TBD
4	Subsurface		TBD
5	Space		TBD

30.4.2 Soviet Life Forms. All entity type codes for U.S. Life Forms have a country field value of 1. The following list defines valid field values for Life Forms.

APPENDIX B2

Domain	Life Form Definition Value	
0 Other	0	Other
1 Land	1	Scout
	Dismounted Infantry With:	
	2	SA-7 Grail Missile
	3	RPG-7 VAT Rocket Launcher 4 RPG-18
	5	AT-4 Spigot Missile
	6	AT-3 Sagger Missile
	7	AT-7 Saxhorn Missile
	8	7.62mm PK GPMG
	9	7.62mm RPK LMG
	10	7.62mm AK and AKM Assault Rifles
	11	5.45mm AKS-74 Assault Rifle
	12	7.62mm SVD Sniper Rifle
	13	RKG-3M At Hand Grenade
	14	RGD-5 Hand Grenade
	15	AGS-17 Plamya Grenade Launcher
2 Air		None
3 Surface		TBD
4 Subsurface		TBD
5 Space		TBD

30.4.3 French Life Forms. All entity type codes for French Life Forms have a country field value of 3. The following list defines valid field values for Life Forms.

Domain	Life Form Definition Value	
0 Other	0	Other
1 Land	1	Scout
	Dismounted Infantry With:	
	2	ACL-STRIM
	3	Mistral Missile
	4	Milan AT Missile
	5	LRAC F1 89mm AT rocket launcher
	6	FA-MAS rifle
	7	AA-52 machine gun
	8	58mm Rifle Grenade
	9	FR-F1 Sniper Rifle

2	Air	None
3	Surface	TBD
4	Subsurface	TBD
5	Space	TBD

30.4.4 West German Life Forms. All entity type codes for West German Life Forms have a country field value of 4. The following list defines valid field values for Life Forms.

Domain		Life Form Definition Value	
0	Other	0	Other
1	Land	1	Scout
		Dismounted Infantry With:	
		2	TBD
2	Air		None
3	Surface		TBD
4	Subsurface		TBD
5	Space		TBD

30.4.5 British Life Forms. All entity type codes for British Life Forms have a country field value of 5. The following list defines valid field values for Life Forms.

Domain		Life Form Definition Value	
0	Other	0	Other
1	Land	1	Scout
		Dismounted Infantry With:	
		2	LAW 80
		3	Blowpipe
		4	Javelin
		5	51mm mortar
		6	SLR 7.62mm Rifle
		7	Sterling 9mm SMG
		8	L7A2 General Purpose Machine Gun
		9	L6 Wombat Recoilless rifle,
		10	Carl Gustav 89mm Recoilless rifle

		11 SA80 Indiv wpn/light support wpn 12 Trigat 13 Milan AT missile
2	Air	None
3	Surface	TBD
4	Subsurface	TBD
5	Space	TBD

APPENDIX C

Defined Repair Types

10. SCOPE.

10.1 Scope. This Appendix defines the different Repair Types specified by this standard. This Appendix is a mandatory part of the standard. The information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. DETAILS.

The following repair types are defined for all platform types.

30.1 Subsystems. Platforms consist of a number of subsystems. Within these major subsystems, repairs can be defined.

30.1.1 Propulsion Systems.

1 repair motor
2 replace motor
3 repair starter
4 replace starter
5 repair alternator
6 replace alternator
7 repair generator
8 replace generator
9 replace battery
10 replace fuel filter
11 repair engine coolant leak
12 repair transmission oil leak
13 repair engine oil leak
14 repair pumps
15 replace pumps
16 repair filters
17 replace filters

30.1.2 Hull/Airframe/Body.

17 repair hull
18 repair airframe

30.1.3 Interface to Environment Systems.

19 repair propeller
20 replace propeller
21 repair transmission
22 replace transmission
23 replace filters
24 repair brake
25 replace brake

30.1.4 Weapon Systems.

26 repair gun elevation drive
27 repair gun stabilization system
28 repair gunner's primary sight (GPS)
29 repair commander's extension to the GPS
30 repair loading mechanism

30.1.5 Fuel Systems.

31 repair fuel transfer pump
32 repair fuel lines
33 replace gauges

30.1.6 Electronic and Communications Systems.

34 repair electronic counter measure systems
35 repair electronic warfare systems
36 repair laser range finder
37 repair radios
38 replace radios
39 repair intercoms
40 replace intercoms
41 repair coders
42 replace coders
43 repair decoders
44 replace decoders
45 repair lasers
46 replace lasers
47 repair computers
48 replace computers
49 repair emitters
50 replace emitters
51 repair detection systems
52 replace detection systems

30.1.7 Life Support Systems.

53 replace air supply
54 replace filters

55 replace water supply
56 repair refrigeration system
57 repair chemical, biological, and radiologic protection
58 replace chemical, biological, and radiologic protection
59 repair water wash down systems
60 repair decontamination systems

30.1.8 Hydraulics Systems and Actuators.

61 repair water supply
62 replace water supply
63 repair cooling system
64 replace cooling system
65 repair winches
66 repair catapults
67 repair cranes
68 repair launchers

30.1.9 Auxiliary Craft.

69 repair life boats
70 repair landing craft
71 replace landing craft
72 repair ejection seats
73 replace ejection seats

APPENDIX D

Appearance Field Bit Definition

10. SCOPE.

10.1 Scope. This Appendix defines the different Appearances specified by the appearance field in the ENTITY APPEARANCE PDU. This Appendix is a mandatory part of the standard. The information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. DETAILS.

This appendix defines the 32 bit Appearance field used in the Entity Appearance PDU to describe changes to entities' appearance attributes.

30.1 Platforms. The 32 bits are defined for a platform depending on the Domain it operates in. The following sections describe the bit definition of this field for all Domains. The Domain field is defined in the Entity Type Definition in Appendix B1.

30.1.1 Platforms of the Land Domain. The 32 bit appearance field for land platforms is defined as follows:

Name	Bits	Purpose
Destroyed	0	is 1 if platform is destroyed, 0 otherwise
SmokePlume	1	is 1 if a smoke plume is rising from the platform, 0 otherwise
Flaming	2	is 1 if flames are rising from the platform, 0 otherwise
DustCloudMask	3-4	describes any dust cloud being raised by the platform: 0: no dust cloud 1: small dust cloud 2: medium dust cloud 3: large dust cloud

PaintScheme	5-6	describes the paint scheme of the platform: 0: not applicable 1: winter colors 2: desert colors
Appendages	7-10	describes any appendages to the original platform: 0: none 1: bulldozer blades 2: mine clearing 3: rollers 4: swimming gear
LauncherUp	11	is 1 if the platform's missile launcher is raised, 0 otherwise
EngineSmoke	12	is 1 if the platform is emitting engine smoke, 0 otherwise
Muzzle1Flash	13	is 1 if the first muzzle is flashing, 0 otherwise
Muzzle2Flash	14	is 1 if the second muzzle is flashing, 0 otherwise
Muzzle3Flash	15	is 1 if the third muzzle is flashing, 0 otherwise
Muzzle4Flash	16	is 1 if the fourth muzzle is flashing, 0 otherwise
	17-29	other appearance attributes specific to land platforms can be defined

30.1.2 Platforms of the Air Domain. The 32 bit appearance field for air platforms is defined as follows:

Name	Bits	Purpose
Destroyed	0	is 1 if platform is destroyed, 0 otherwise
Flaming	1	is 1 if flames are rising from the platform, 0 otherwise

GearPosition	2	is 1 if gear is up, 0 otherwise
FlapPosition	3	is 1 if flaps are up, 0 otherwise
rightAileronPos	4	is 1 if right aileron is up, 0 otherwise
Afterburner	5	is 1 if after burner is on, 0 otherwise
RunningLights	6	is 1 if running lights are on, 0 otherwise
DoorPosition	7	is 1 if door position is open, 0 otherwise
SpeedBrake	8	is 1 if brake is deployed, 0 otherwise
FuelProbe	9	is 1 if probe is out, 0 otherwise
Missiles	10-13	specifies the number of missiles present
Bombs	14-17	specifies the number of bombs present
FuelTanks	18-20	specifies the number of fuel tanks present
Muzzle1Flash	21	is 1 if the first muzzle is flashing, 0 otherwise
Muzzle2Flash	22	is 1 if the second muzzle is flashing, 0 otherwise
Muzzle3Flash	23	is 1 if the third muzzle is flashing, 0 otherwise
Muzzle4Flash	24	is 1 if the fourth muzzle is flashing, 0 otherwise
	25-31	other appearances attributes specific to air platforms can be defined

30.1.3 Platforms of the Surface Domain. The 32 bit appearance field for surface platforms is defined as follows:

APPENDIX D

Name	Bits	Purpose
Destroyed	0	is 1 if platform is destroyed, 0 otherwise
Flaming	1	is 1 if flames are rising from the platform, 0 otherwise
wake	2-4	describes the presence and size ofb o w wake around the platform: 0: there isn't any 1: small 2: medium 3: large
RunningLights	5	is 1 if running lights are on, 0 otherwise
Muzzle1Flash	6	is 1 if the first muzzle is flashing, 0 otherwise
Muzzle2Flash	7	is 1 if the second muzzle is flashing, 0 otherwise
Muzzle3Flash	8	is 1 if the third muzzle is flashing, 0 otherwise
Muzzle4Flash	9	is 1 if the fourth muzzle is flashing, 0 otherwise
Muzzle5Flash	10	is 1 if the fifth muzzle is flashing, 0 otherwise
Muzzle6Flash	11	is 1 if the sixth muzzle is flashing, 0 otherwise
Muzzle7Flash	12	is 1 if the seventh muzzle is flashing, 0 otherwise
Muzzle8Flash	13	is 1 if the eighth muzzle is flashing, 0 otherwise
Muzzle9Flash	14	is 1 if the ninth muzzle is flashing, 0 otherwise
Muzzle10Flash	15	is 1 if the tenth muzzle is flashing, 0 otherwise

	16-31	appearances attributes specific to surface platforms

30.1.4 Platforms of the Sub-surface Domain. The 32 bit appearance field for sub-surface platforms is defined as follows:

Name	Bits	Purpose
Destroyed	0	is 1 if platform is destroyed, 0 otherwise
wake	1-3	describes the presence and size of bow wake around the platform: 0: none 1: small 2: medium 3: large
periscopePos	4	is 1 if periscope is raised, 0 otherwise
RunningLights	5	is 1 if running lights are on, 0 otherwise
Mastpos	6	is 1 if mast is up, 0 otherwise
	7-31	appearances attributes specific tos u b - surface platforms

30.1.5 Platforms of the Space Domain. The 32 bit appearance field for space platforms is defined as follows:

Name	Bits	Purpose
Destroyed	0	is 1 if platform is destroyed, 0 otherwise
	1-31	appearances attributes specific tospace platforms

30.2 Munitions.

30.2.1 Guided Munitions. The 32 bit appearance field for guided munitions is defined as follows:

Name	Bits	Purpose
LaunchFlash	0	is 1 if launch is producing a flash, 0 otherwise
RocketFlame	1	is 1 if flame is present, 0 otherwise
	2-31	appearances attributes specific tospace platforms

30.3 Life Forms.

30.3.1 Life Forms. The 32 bit appearance field for Life Forms is defined as follows:

Name	Bits	Purpose
LifeformState	0-3	describes the state of the life form: 0: destroyed 1: upright 2: kneeling 3: prone
WeaponPos	4	is 1 if weapon is deployed, 0 if weapon is stowed
	5-31	appearances attributes specific tospace platforms

30.4 Environmentals.

30.4.1 Environmentals. The 32 bit appearance field for Environmentals is defined as follows:

Name	Bits	Purpose
Size	0-3	describes the size of the environmental: 0: very small 1: small 2: medium 3: large 4: very large

Density	4-6	describes the density of the environmental: 0: clear 1: hazy 2: dense 3: very dense 4: opaque
	7-31	appearances attributes specific tospace platforms

30.5 Cultural Features.

30.5.1 Cultural Features. The 32 bit appearance field for cultural features is defined as follows:

Name	Bits	Purpose
Damage	0-2	describes the damaged appearance of a cultural feature: 0: none 1: slight damage 2: moderate damage 3: destroyed
SmokePlume	1	is 1 if a smoke plume is rising from the cultural feature, 0 otherwise
Flaming	2	is 1 if flames are rising from the cultural feature, 0 otherwise
	3-31	appearances attributes specific tospace platforms

APPENDIX E

ORGANIZATIONAL UNIT

10. SCOPE.

10.1 Scope. This Appendix defines the types of Organizational Units to which an entity can belong. This Appendix is a mandatory part of the standard. The information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. DETAILS.

30.1 Hierarchy of Units. Each unit in the simulation belongs to a hierarchy of organizational units. The hierarchy shall consist of the following components:

Force
Country
Service
Not Used
Service Hierarchy

30.1.1 Force ID. Force shall refer to the highest level organizational component. This field shall be an 8 bit enumeration and shall have the following values:

0	Other
1	Blue Forces (U.S., NATO, SEATO, Etc.)
2	Red Forces (USSR, Warsaw Pact, Medellin Cartel, Etc.)
3	White Forces (Neutral)

30.1.2 Country ID. Country shall refer to the country to which this unit belongs. This field shall be an 8 bit enumeration and shall have the following values:

0	Other
1	U.S.
2	U.S.S.R
3	France
4	West Germany
5	United Kingdom
6	Japan

7	China
8	Iran
9	Italy
10	Poland
11	East Germany
12	Iraq
13	Saudi Arabia
14	Czechoslovakia
15	India
16	Canada
17	Romania
18	Spain
19	Bulgaria
20	Netherlands

30.1.3 Service ID. Service shall refer to the military service to which the unit belongs. This field shall be an 8 bit enumeration and shall have the following values:

0	Other
1	Army
2	Air Force
3	Coast Guard
4	Marines
5	Navy

30.1.4 Hierarchy. The service hierarchy shall consist of eight 8-bit unsigned integers that, starting at the top of the hierarchy, give the unit organizational number at each level of the hierarchy. The representation of the 8 fields will depend on the service represented.

APPENDIX E

30.1.4.1 Army. For Army units, the unit organizational numbers shall be listed in the following order:

Army Number
Corps Number
Division Number
Regiment Number
Battalion Number
Company Number
Platoon Number
Squad Number

FIGURE E-1. **Army Organizational Order**

30.1.4.2 Air Force. For Air Force units, the unit organizational numbers shall be listed in the following order:

Air Force Number
Wing Number
Squadron Number
Flight Number
Division Number
Section Number
Spare
Spare

FIGURE E-2. **Air Force Organizational Order**

30.1.4.3 Coast Guard. For Coast Guard Units, the unit organizational numbers have not been determined.

30.1.4.4 Marines. For Marine units, the unit organizational

numbers shall be listed in the following order:

Fleet Number
Marine Expeditionary Force Number
Marine Expeditionary Brigade Number
Marine Expeditionary Unit Number
Spare
Spare
Spare
Spare

FIGURE E-3. **Marine Organizational Order**

30.1.4.5 Navy. For Navy units, the unit organizational numbers shall be listed in the following order:

Fleet Number
Force Number
Group Number
Unit Number
Element Number
Spare
Spare
Spare

FIGURE E-4. **Navy Organizational Order**